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PART III

ENVIRONMENTAL PROTECTION AGENCY

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CLEAN AIR ACT

Assessment and Collection of Penalties for Noncompliance

[6560-01-M]

ENVIRONMENTAL PROTECTION AGENCY

[40 CFR Parts 66 and 67]

[FRL 1051-5]

ASSESSMENT AND COLLECTION OF NONCOMPLIANCE PENALTIES

AGENCY: Environmental Protection Agency.

ACTION: Proposed Rule.

SUMMARY: The regulations below establish the procedures by which EPA and the States will assess and collect noncompliance penalties under Section 120 of the Clean Air Act (42 U.S.C. 7420). The regulations also set forth the means by which the States may assume delegation of the noncompliance penalty program. The purpose of these mandatory penalties is to recover the costs avoided by a source in not complying with Clean Air Act requirements after mid-1979. The proposed regulations define which sources are subject to the noncompliance penalty, as well as setting forth the situations in which the source may qualify for an exemption. To calculate the economic benefits of noncompliance EPA has developed a mathematical model that is set forth below.

DATES: Comments must be received on or before June 19, 1979. Proposed effective date: 30 days after promulgation. Public hearings on this proposal will be held on May 3 and 4, May 7 and 8, and May 10 and 11, at the locations listed under "ADDRESSES."

ADDRESSES: Questions or comments on this proposal should be directed to the Director, Division of Stationary Source Enforcement, EN-341, Environmental Protection Agency, 401 M Street, SW, Washington, D.C. 20460. Public hearings on this proposal will be held at the following locations:

Conference Room 2409, 2126, U.S. Environmental Protection Agency, 401 M Street SW, Washington, D.C.—May 3 and 4.

Adams Room, Midland Hotel, 172 W. Adams, Chicago, Illinois—May 7 and 8.

Sixth Floor Conference Room, U.S. Environmental Protection Agency, 2153 Fremont Street, San Francisco, California—May 10 and 112.

All hearings on the first day will commence at 9:30 A.M. with an evening session beginning at 7:30 P.M. On the second day hearings will commence at 9:30 A.M. and conclude when appropriate.

FOR FURTHER INFORMATION CONTACT:

Robert Homiak, Attorney-Advisor, Division of Stationary Source Enforcement, Environmental Protection Agency, at (202) 755-2581.

SUPPLEMENTARY INFORMATION: The Clean Air Act Amendments of 1977 (Pub. L. 95-95) added Section 120 to the Clean Air Act (42 U.S.C. 7420). This section requires promulgation of regulations for the assessment and collection of noncompliance penalties against stationary source violators of certain requirements under the Clean Air Act.

I. Background

The 1970 Clean Air Act established mid-1975 as the deadline for achieving public health related National Ambient Air Quality Standards. Two additional years were available in areas with particularly difficult air pollution control problems. While the majority of the Nation's 23,000 major sources of air pollution are in compliance with State and Federal requirements, a substantial number are not. Many of these noncomplying sources have particularly high levels of pollutant emissions. For example, many steelmaking facilities emit great quantities of particulate matter, while electric power plants are a significant source of SO_x emissions.

Those sources that have violated the law by failing to install and operate pollution control devices necessary to achieve compliance with applicable requirements have enjoyed an economic advantage over the larger number of sources that have made the expenditures necessary to comply. The economic savings a source may realize by not installing the necessary controls has created an incentive to delay compliance in many instances. Until the passage of the 1977 Amendments, the regulatory and enforcement measures authorized by the Act lacked direct economic incentives to ensure prompt and continous compliance.

In enacting Section 120, Congress required EPA to assess and collect administratively a penalty designed to capture the economic savings realized by a firm as a result of noncompliance with the law after mid-1979. Thus, the penalty will eliminate most of the economic advantage gained by a noncomplying firm after mid-1979 relative to a firm that achieves compliance by this date.[1]

Assessment of noncompliance penalties against sources subject to Section 120 of the Act is mandatory. Such penalties are in addition to, not in lieu, of, any other payments, sanctions or requirements under the Clean Air Act. The noncompliance penalty program is separate from all other enforcement actions under the Act, and will not affect or be affected by any civil or criminal proceedings brought under any other provision of the Act or State or local law.

Noncompliance penalties must be assessed administratively by EPA or by a State. It is clear that Congress intended that the States should play a major role in implementing this program. EPA encourages States to seek a delegation of authority to implement the noncompliance penalty program as soon as possible.

II. Applicability of Regulations

A. General Applicability

The Act requires that noncompliance penalties be assessed against any major stationary source that is not in compliance with any emission limitation, emission standard or compliance schedule under an applicable implemenatation plan. The only exception to this rule is for primary nonferrous smelters that have received primary nonferrous smelter orders under Section 119.

Section 302(j) of the Act defines a "major stationary source" as one that emits or has the potential to emit one hundred tons per year or more of any air pollutant. The regulations define "potential to emit" as the capability at maximum capacity to emit a pollutant in the absence of air pollution control equipment. "Air pollution control equipment" includes control equipment which is not, aside from air pollution control laws and regulations, vital to production of the normal product of the source or to its normal operation. These definitions are the same as the definition of a parallel statutory term contained in EPA's regulations covering the prevention of significant deterioration (PSD) of air quality. (40 CFR 52.21(b)(3) and have been subjected to extensive public review and comment. EPA's position on this issue is set forth in the preamble to the final PSD regulations. *See* 43 Fed. Reg. 26391-92 (June 19, 1978).

In addition to major stationary sources that are in violation of SIP requirements, all stationary sources (regardless of size) that are out of compliance with any emission limitation, emission standard, standard of performance or other requirement established under Section 111 (New Source Performance Standards) or 112 (National Emission Standards for Hazardous Air Pollutants) of the Act are also subject to the penalty.

Finally, any source that is exempted from the penalty must remain in compliance with all interim emission control requirements or schedules of com-

[1] The noncompliance penalty is designed to remove the economic benefits gained by a noncomplying source from mid-1979 until such time as final compliance is achieved. In order to capture those savings a source realized from its noncompliance prior to mid-1979, EPA could commence a civil action pursuant to section 113(b) and seek appropriate civil penalties.

pliance established under the extension, administrative order, consent decree or court order, or suspension which led to the exemption. If the source fails to meet an interim requirement or schedule, it will be subject to penalties. This includes a primary nonferrous smelter that is not in compliance with any iterim requirement under a primary nonferrous smelter order. No source may be excused from the penalty unless it meets one of the exemptions specified in Subpart D of Part 66 of the regulations.

In most instances, the source's noncompliance will result from a failure to install control equipment or use required fuels. In others, however, the noncompliance will be caused by a failure to operate and maintain control equipment or other processes in a manner adequate to ensure continuous compliance. Both types of violation subject the source to a noncompliance penalty.

The fact that a source is subject to a court-imposed schedule contained in a consent decree, court order, or an administratively issued DCO does not by itself relieve it from liability for the penalty. In order to obtain an exemption, any such source must satisfy the criteria set forth in Section 120(a)(2)(B) or (C).

B. APPLICABLE DATES

In Section 120 of the Act there are apparently contradictory indications as to the earliest date from which the noncompliance penalty will be assessed. Section 120(d)(3)(C)(i) provides that for sources issued a notice of noncompliance on or before August 7, 1979, the "period of covered noncompliance" begins on this date. Section 120(d)(3)(C)(ii), however, provides that the "period of covered noncompliance" commences on the date of issuance of the notice of noncompliance, whenever such notice is issued after July 1, 1979. Thus, for any source issued a notice of noncompliance after July 1, but prior to August 7, 1979, the appropriate date for the assessment of the penalty would be uncertain. In order to ensure consistency, EPA has chosen August 7, 1979, as the date from which the noncompliance penalty will be calculated for those sources issued notices of noncompliance on or prior to this date, but invites comment on this issue. Where the notice is issued after August 7, 1979, the applicable period will begin on the date of issuance of the notice.

If a source becomes subject to a newly-imposed emission limitation or to an additional increment of control, Section 120(g) provides that the date for imposition of the penalty relating to the newly-imposed emission limitation or additional increment of control will be July 1, 1979, or the date on which the source must demonstrate compliance with such emission limitation or increment of control, but in no event later than three years after the approval or promulgation of the requirements. This provision should be extremely important in light of the nonattainment SIP revisions required to be submitted to EPA by January 1979. The date on which the source must demonstrate final compliance will be specified in the SIP itself. Thus, if the new emission control regulations require immediate compliance with the newly-imposed emission limitation or additional increment of control, the noncomplying source will be subject to a noncompliance penalty as of August 7, 1979. If the new regulations require compliance at a future date, the source will not be subject to a noncompliance penalty for violations of the newly-imposed emission limitation or additional increment of control until that date, not later than three years after the approval or promulgation of that requirement, provided of course that it satisfies all applicable interim requirements.

The provision in Section 120(g) that imposition of the penalty will occur no later than three years after the promulgation of the new requirement immediately raises the question of how the Section 120 penalty applies in cases in which other provisions of the statute explicitly allow compliance with SIP provisions more than three years after they have been promulgated. For example, in the case of carbon monoxide or photochemical oxidants standards, Section 172(a)(2) provides that final compliance for some sources in certain areas may be delayed until as late as December 31, 1987. Section 172(c) requires that SIP provisions to ensure attainment of the ambient air quality standards by December 31, 1987, be approved or promulgated by July 1, 1982. For these sources, Section 120(g) would seem to require that a penalty be assessed no later than July 1, 1985. The question thus arises whether a source that is in compliance with the interim requirements contained in the SIP through 1987 would still be subject to a noncompliance penalty. The Agency believes that in this case, no penalty would be imposed, provided of course that the SIP itself specified a final compliance date of 1987. The Agency solicits comments on this issue.

C. CONTINUITY OF EXISTING SIP REQUIREMENTS

As noted, SIP revisions submitted to meet the requirements of Part D of the Act are expected to establish new requirements for some sources. Whether the revised SIP contains immediately effective or future effective regulations, the Agency will require any source subject to new SIP requirements to meet the requirements of the pre-existing SIP until such time as it has demonstrated continuing compliance with the new requirements. Keeping the pre-existing SIP requirements in effect is necessary to prevent a source from operating uncontrolled or under less stringent controls while it is moving towards compliance with the new regulations. Violations of these pre-existing requirements will subject the source to noncompliance penalties.

The only exception to this rule would occur when the new regulations require a type of control equipment that is incompatible with that already in operation. In such cases the source will not be required to meet the provisions of the old SIP during that time in which it is physically impossible to keep the existing equipment in operation while simultaneously installing the new device. This exception will be construed narrowly. Only the period during which an actual physical impossibility exists may be covered by an exception. For example, in the design and contract phases of a new compliance schedule, there should normally be no exception from the pre-existing emission limit. Similarly, a source that did not have any type of control equipment in operation at the time the new requirement was adopted would normally not be eligible for this exception. (Further guidance on this issue is available from EPA Regional Offices.)

III. PROCEDURES FOR ASSESSMENT AND CALCULATION OF THE NONCOMPLIANCE PENALTY

A. ISSUANCE OF NOTICE OF NONCOMPLIANCE

EPA or State issuance of a notice of noncompliance is the trigger for assessing and collecting the noncompliance penalty. Notices will generally be issued by August 7, 1979, or thirty days after discovery of the source's noncompliance, whichever is later. The notice will inform the source of its duty to calculate the amount of its penalty and schedule of payments as required by Section 120(b)(4)(A) (based on instructions contained in an enclosed Manual and Technical Support Document), and of its right to petition for a hearing to challenge the finding of noncompliance or to claim an exemption. The source must, within forty-five days of receipt of the notice, either calculate the penalty and schedule, or submit such a petition.

Where a source does not properly submit its calculation and schedule or the data necessary to verify these, EPA may enter into a contract to determine the amount of the penalty and the payment schedule applicable

for that source. The costs of such a contract will be added to the amount of the source's penalty.

B. CALCULATION OF THE PENALTY

Section 120 of the Act provides that the penalty be not less than the economic value of delay to the owner of the source, including three elements: (1) the quarterly equivalent of the capital costs; (2) the operation and maintenance costs; and (3) "any additional economic value which such a delay may have for the owner or operator of such source."

The first component arises because owners of sources that have not invested in required air pollution controls have had the opportunity to invest their funds instead in projects that yield a direct economic benefit to the firm. The second component of savings from delayed compliance is the operation and maintenance costs that would have been incurred if the source had complied. These include labor, raw materials and energy costs, as well as any other expenditures directly associated with the operation of the pollution control equipment. In addition, certain operation and maintenance costs may be required to achieve compliance even where no pollution control equipment is required. Delaying compliance means that these expenditures are avoided. The noncompliance penalty also removes these savings.

The economic model accounts only for these two components. By so doing, we believe the model captures the most significant portion of any saving that can be realistically quantified. It is conceivable that there might be instances in which a source owner realizes additional economic benefit from his noncompliance. If such a situation exists, EPA would have to balance carefully the benefits of recovering these additional benefits against the administrative burdens involved. We encourage the public to suggest possible situations in which EPA's present economic model would not be capable of calculating additional benefits of a source's noncompliance, and indicate possible ways in which these additional benefits might be estimated.

The Act specifies that all penalty payments be equal; however, the legislative history surrounding its enactment indicates that this should be interpreted as an equality in real dollar terms. That is, if inflation is expected to cause costs to escalate, that escalation ought to be reflected in the noncompliance penalty. A penalty that does not rise with expected inflation, but merely averages inflation, gives an overestimate of the savings from noncompliance in the early years of equipment life and an underestimate in the final years.

Calculation of the penalty is based on widely accepted principles of financial and economic theory. The model itself utilizes twelve financial parameters. These parameters, their impact on the penalty, and the sources for obtaining them are discussed in detail in the Technical Support Document. One of these parameters concerns the appropriate way for EPA to discount a source's future cash flows. The discount rate used in this proposal is based upon the source's return on equity. An alternative to this equity discounting method utilizes the weighted average cost of capital. Both of these methods of discounting are discussed in the accompanying Technical Support Document, along with our rationale for selecting the return on equity. EPA encourages public comment on the appropriateness of our approach.

In developing the model, the Agency carefully considered the feasibility and cost of administration to EPA, the States, and the sources. Wherever feasible, the model uses data that is specific to the individual source. However, some of the functions for a specific source are often difficult to determine in advance. For this reason, industry-wide averages are used for certain parameters (inflation rate, discount rate, and the after-tax return on shareholder's equity), and national averages are used for the rates of return on debt and preferred stock. The use of such industry and national averages greatly reduces the administrative costs, both to the firm and EPA. In utilizing this data, care has been taken to ensure that the effect on the size of the resulting penalty will be slight. In most instances, where a choice among alternative assumptions or data sources had to be made, the one resulting in the lowest penalty was selected. In framing this model, EPA has relied on accepted methods of financial calculation that are widely used by businesses making calculations for their own business purposes.

C. THE EFFECT OF PRECOMPLIANCE EXPENDITURES

Section 120(d)(2)(B) provides that the noncompliance penalty should be reduced to reflect any expenditures made by the source during any quarter for the purpose of achieving compliance, but only "to the extent that such expenditures have not been taken into account" in the initial calculation. In this proposal, the Agency has adopted an approach that grants the source owner an allowance for expenditures made toward the purchase of pollution control equipment, while also capturing a significant portion of the costs avoided by noncompliance. Any expenditure that the source anticipates making in any quarter towards achieving compliance will be factored into the initial calculation of the penalty. The model divides the expenditures avoided into a capital component and an operation and maintenance (O&M) component, and reduces the penalty by an amount representing the same proportion to the quarterly payment as that quarter's estimated expenditure is to the total amount necessary to comply. For example, if a source by avoiding compliance is saving $200,000 per quarter in capital costs and $100,000 in O&M costs, then the penalty would be $300,000 per quarter in the absence of any consideration of credits. Under the approach EPA is proposing, if by the end of a given quarter the source would have made half the capital expenditures, the capital portion of the penalty would be reduced by the same proportion, to $100,000. Similarly, if in that quarter the source made $40,000 in O&M expenditures directly related to correcting the noncompliance at issue, the O&M portion of the penalty would be reduced by $40,000 (or 40%). The Agency believes that this approach is the one that most exactly recaptures the cost savings from delay beginning after the notice of noncompliance was issued, and is therefore the one that most nearly fits the statutory intent. This position is explained in more detail in the Technical Support Document.

EPA evaluated several different methods of implementing this statutory language. One alternative would permit the source to deduct from its quarterly penalty assessment an amount equal to that expended during that quarter towards achieving compliance. This "dollar for dollar" credit interpretation was rejected for several reasons.

First, giving a source a "dollar for dollar" credit would radically diminish and probably eliminate all penalties, thus defeating the purpose of the noncompliance penalty provision. Congress included Section 120 to remove the economic advantages that accrue to noncomplying sources. If the Agency were to utilize a "dollar for dollar" credit approach, sources would be able to offset their penalty payments completely. Thus, these sources would have achieved an unfair competitive edge by failing to install the necessary pollution controls. This result would frustrate the purpose of the penalty program.

There are also sound air quality reasons for rejecting a "dollar for dollar" credit approach. Because it would be able to offset completely any penalty assessed, the source would be encouraged to extend its projected compliance schedule as far into the future as possible. This incentive to delay compliance would have the effect of fur-

ther worsening the air quality in nonattainment areas, as well as possibly consuming the SO_2 and particulate matter increments in areas where the air quality is currently better than the National Ambient Air Quality Standards. For these reasons the Agency believes that adopting a "dollar for dollar" credit approach would be unwarranted.

The net payments for all of the quarters of noncompliance will be discounted and summed to derive their total present value. This present value will then be converted into a series of escalating payments to take into account the effects of inflation. These payments will be due at the beginning of each quarter.

D. REPLACEMENT FACILITIES

Another issue which the Agency is considering is whether sources that desire to replace older facilities should be granted some allowance in the initial calculation of the penalty for control equipment installed on the new replacement facility. As a statutory matter, the Agency is not required to recognize a replacement facility as a means of compliance. (See Section 113(d)(3), which contains the only statutory reference to sources that are replacing existing facilities. This section provides that the source must shut down its existing facility no later than July 1, 1979, in order to receive an administrative order.) As a policy matter, however, the Agency wishes to encourage modernization since it usually results in the replacement of older facilities with more efficient and cleaner ones. For this reason, sources constructing replacement facilities will be granted a reduction in the penalty, in accordance with the criteria specified below.

For the purposes of this section, the Agency is considering defining a "replacement facility" as one that serves the same function and produces the same product as the one it replaces. It would not be necessary that the new facility be *identical* to the one being replaced, but it must be of substantially the same, or greater, capacity as the existing facility in making the same product and no more polluting per unit of production. Thus, a steelmaking company that decided to substitute a new electric arc furnace for its noncomplying open hearth furnace could be eligible for a replacement allowance. This allowance would be granted on a pro rata basis. Cases may arise in which the production capacity of the replacement facility is less than that of the existing facility. In this case the Agency might wish to determine an appropriate credit in a different manner. We encourage comment on other situations that might arise, and how the Agency may best determine an appropriate credit amount.

The Agency is considering calculating noncompliance penalties for replacement facilities in the following manner. The appropriate penalty, reflecting the economic value the source has gained by virtue of its noncompliance, would be based upon the estimated costs of retrofitting needed control equipment on the existing facility. These costs appear to form the proper basis for computing the penalty, since it is the existing source that is continuing to derive an economic beneit by not complying with applicable requirements. The amount of the credit, however, would be premised upon the costs the source would actually incur in constructing and operating pollution control equipment at the new facility. Utilizing these inputs, the noncompliance penalty would be calculated using the existing economic model. The payment schedule will run, and the source will be assessed a penalty, until it has closed down operation of its existing noncomplying facility, commenced operation of its replacement facility, and demonstrated compliance with all applicable legal requirements. For example, if the cost of constructing pollution control equipment at the new facility would be $10 million and the source spends $1 million prior to the first quarter in which the penalty is assessed, it would be able to reduce the capital portion of the penalty for that quarter by 10%. This method of calculation would be employed whether the costs associated with the construction of the new facility exceeded, or were lower than, those that the source would have incurred in retrofitting the existing plant. If the source replaces its existing facility with one that utilized an inherently less polluting production process, EPA will again determine what controls would have been necessary on the old facility to achieve compliance. Based on this data the Agency would then determine an appropriate credit amount. The Agency welcomes comment on both the desirability of granting an allowance to sources replacing older facilities and also upon the method we have proposed to accomplish this.

Because computation of the noncompliance penalty requires lengthy arithmetic calculations, the EPA Office of Enforcement will make available, at nominal cost, a program listing for time-shared computers that calculate the penalty. Calculation of the penalty must be in accordance with the formulae contained in the Manual and Technical Support Document. (These documents appear as Appendices A and B to the proposed regulations.) Though sources are free to use other programs if they wish, the proposed regulations state that any program which gives different results from the program which appears as Appendix C to these regulations will be automatically disregarded.

E. PAYMENT OF PENALTY

The penalty will be paid quarterly, and the first payment will be due six months after the notice of noncompliance was issued or on January 1, 1980, whichever is later. If any source is late in making a quarterly payment, Section 120(d)(5) of the Act requires that a twenty percent late payment penalty shall be added to the aggregate penalty that is unpaid.

F. FINAL ADJUSTMENT

After a source has come into compliance, it must so notify the Administrator, who must make the determination that the source is no longer violating applicable requirements. If this determination is made, the Act requires that a final accounting of the penalty, based on the actual costs of compliance to that source, be made within 180 days. Where an underpayment occurred, the source must pay that deficiency plus interest within thirty days after the adjustment. Similarly, EPA or the State administering the program will reimburse a source with interest for any overpayment that has occurred.

EPA would prefer to use the same rate of return on equity that is used to calculate the penalty as the defined interest rate. This is the rate most consistent with the statutory purpose in EPA's opinion, since any other rate would result in either penalizing or rewarding sources whose estimated penalties differ from the final calculation as against those whose payments do not. This difference would give firms an incentive to estimate their penalties incorrectly. The prevailing government or commercial interest rates are, of course, also candidates for designation. The Treasury would prefer to use the rate of return on equity as the prevailing rate for firms that underpay and the interest rate the United States must pay to borrow as the interest rate for firms that overpay. Another alternative would be to use the interest rate for long-term bonds. This rate could be used both for overpayments and underpayments. A letter from Assistant Secretary of the Treasury Roger C. Altman and a memorandum setting forth EPA's position are both contained in the administrative record. EPA invites comments on this question.

IV. EXEMPTIONS

Section 120(a)(2)(B) and (C) of the Act sets forth several limited instances in which a source may be exempted from the duty to pay a noncompliance

penalty. If the source desires to request an exemption, it must do so within 45 days of receipt of a notice on noncompliance. Hearings on such requests will be on the record and will follow the procedures set out in the Agency's "Consolidated Rules of Practice" (40 CFR Part 22), except to the extent provided in Subpart J of these regulations. (These Rules were proposed on August 4, 1978, 43 *Fed. Reg.* 34738, and will be promulgated shortly. Citations are to be proposed Rules.)

One category of exemptions is based on the prior issuance of specified orders, extensions or suspensions. Coal conversions pursuant to prohibition orders or delayed compliance orders issued pursuant to Section 113(d)(5), delayed compliance orders based on use of innovative technology under Section 113(d)(4), and emergency implementation plan suspensions under Section 110(f) and (g) are within this category. In each case, however, the order, extension or suspension on which the exemption is premised must actually have been issued. It will not be enough for a source to argue that issuance is authorized or even required.

Section 120(a)(2)(B)(iv) provides that an exemption is also available if a source is unable to comply with applicable requirements for reasons that are entirely beyond its control. The first eligibility criterion for this exemption is that the source must have received a delayed compliance order (DCO) under Section 113(d)(1) of the Act,[2] or an order issued pursuant to Section 113 as in effect prior to enactment of the 1977 Amendments.

A. THE TERM OF THE (B)(IV) EXEMPTION

The first question to be considered is the time period for which such exemptions may be issued. As noted above, prior to making an exemption request under Section 120(a)(2)(B)(iv), a source must have received a delayed compliance order issued under authority of Section 113(d)(1) or a Section 113 order issued prior to the Amendments. Section 113(d)(1)(D) states that any DCO must "provide for final compliance . . . as expeditiously as practicable, but . . . in no event later than July 1, 1979, or three years after the date for final compliance specifed in the state implementation plan, whichever is later." A similar limitation applies to orders and consent decrees issued under Section 113 of the Act as in effect prior to the 1977 Amendments. Section 113(d)(12) voids any such order or decree that provides for a compliance extension beyond July 1, 1979, "unless [the order or decree] is modified under this subsection within one year after the enactment of the Clean Air Act amendments of 1977 to comply with the requirements of this subsection." One of the requirements of Section 113(d) is that final compliance must be required by July 1, 1979.

The legislative history contains numerous expressions of disapproval of the prior practice of EPA and the States in issuing "open-ended" compliance orders with long deadlines. The House Committee questioned the validity of this practice, noting that some EPA orders extended until as late as 1983 or 1985.[3] Similarly, the Senate Committee concluded that EPA's practice had "no basis in law."[4] The new DCO provisions embodied in Section 113(d) were intended to remedy EPA's practice.[5] As a result, the Agency has adopted the position that DCOs may not extend beyond July 1, 1979, unless the compliance date in the applicable implementation plan is later than July 1, 1976.

The Agency's reading of Section 113(d) significantly limits the Section 120(a)(2)(B)(iv) "inability to comply" exemption, since the noncompliance penalty program does not take effect until after July 1, 1979. As with Section 113(d) DCO's, a literal approach to Section 113(d)(1)(D) results, to a great extent, in reading the reference to prior Section 113 orders out of the (B)(iv) exemption provision.

Under this literal interpretation of Section 113(d)(1)(D), there are four categories of sources that would be eligible to receive DCOs extending beyond July 1, 1979, since their SIP final compliance dates could be later than July 1, 1976:

(a) sources not subject to emission limitations under the existing SIP, made subject to such limitations by a SIP revision;

(b) sources subject to emission limitations in the existing SIP made subject to an additional increment of control (i.e., a more stringent limitation) in the new SIP;

(c) sources located in areas for which the date for final compliance under the SIP is later than July 1, 1976; and

(d) sources located in areas attaining the national ambient air quality standards which can be permitted additional time to achieve compliance because such sources will not impact on the continued attainment and maintenance of the standards.

In cases (a) and (b), the DCO may be issued for a period extending up to three years from the date for final compliance with the newly-imposed emission limitation or for the added increment of control (but not for the degree of control required in the existing SIP). This three year period may extend beyond July 1, 1979, in cases in which the final compliance date in the new requirement or newly-added increment of control is a date after July 1, 1976. For the most part, such new emission limitations or newly-added increments of control will be imposed in the SIP revisions for nonattainment areas required to be submitted to EPA by Sections 110(a)(2)(I) and 172 of the Act as a precondition for new source construction or source modification after July 1, 1979. In cases (c) and (d), the DCO may be issued for a period extending up to three years from the date for final compliance specified in the SIP. This three year period could extend beyond July 1, 1979, in any case in which the SIP compliance date is later than July 1, 1976. Any sources receiving a DCO extending beyond July 1, 1979, may be eligible for an exemption under Section 120(a)(2)(B)(iv) if they can demonstrate an inability to comply as discussed below.

While the Agency's literal interpretation of Section 113(d) will allow many sources to receive DCOs extending beyond July 1, 1979, other sources will be ineligible to receive such DCOs or modifications of Section 113(a) orders issued prior to the 1977 Amendments. Under a literal reading of Section 120(a)(2)(B)(iv), such sources would be unable to receive an exemption from the noncompliance penalty, even though they were unable to comply for reasons entirely beyond their control.

There are indications in the statute and legislative history, however, that an interpretation of the Act that allows relief to be granted to such sources may be supportable. The legislative history indicates that Congress intended that such exemptions be available for sources subject to pre-1977 SIP requirements. The House bill provided that such sources could be exempted from the penalty based on a complete inability to comply at least through mid-1980.[6] The Senate also apparently contemplated that a source could obtain relief from the penalty if it were unable to comply for reasons entirely beyond its control. The 1977

[2] The reference in (B)(iv) to Section 113(d) orders should be interpreted as meaning delayed compliance orders issued pursuant to (d)(1). Exemptions based upon orders issued pursuant to Sections 113(d)(4) [innovative technology] and (d)(5) [coal conversions] are covered by Section 120(a)(2)(B)(i) and (iii).

[3] H.R. Rep. No. 95-294 95th Cong., 1st Sess 56, FN. 2 (1977), [House Report].

[4] S. Rep. No. 95-127 95th Cong., 1st Sess. 45 (1977) [Senate Report]

[5] *Id.*

[6] H.R. 6161, the House version of the 1977 Clean Air Act Amendments, provided that DCOs could extend five years beyond the final SIP compliance date. Since most pre-existing SIPs provided for final compliance by mid-1975, sources subject to these requirements could be issued DCOs extending until mid-1980. These DCOs would have allowed sources to petition for an exemption from the noncompliance penalties.

[7] Senate Report at 49-50; S. 252 Section 120(e)(2)(B), 95th Cong., 1st Sess. (1977).

Senate bill provided that such sources could seek relief from the penalty in the United States District Court. The opportunity to seek such relief was not predicated upon the prior issuance of an administrative order, and was not limited to any particular time period.[7] This provision for direct judicial relief based on a source's inability to comply was not adopted by the Conference Committee. There is no indication in the legislative history, however, that by tying the grant of an exemption to receipt of a DCO, the Conference Committee intended to prohibit sources that were unable to receive post-79 DCOs from obtaining relief from the penalty.

Section 113(d)(1)(E) also appears to contemplate that major sources which have received DCOs may not achieve compliance until after July 1979, since it explicitly requires DCOs to notify each such source that "unless exempted under Section 120(a)(2)(B) or (C), it will be required to pay a noncompliance penalty effective July 1, 1979, as provided under Section 120 . . . in the event such source fails to achieve final compliance by July 1, 1979."

Third, the Conference Report states explicitly that DCOs may be issued after July 1, 1979, if they establish a delayed compliance penalty.[8] In addition, the Senate bill clearly contemplated that some sources with DCOs would not comply by July 1, 1979, and required that any source issued a DCO with a compliance date later than July 1, 1978, would have to compute its noncompliance penalty. The DCO was to be amended "to include such penalty, to accrue after July 1, 1979."[9] Although the Senate provision for amendment of enforcement orders was not included in Section 113(d)(1)(E), the Conference Committee indicated that the Senate provision on issuance of enforcement orders was being adopted.

B. EPA'S PROPOSED RESOLUTION OF THIS STATUTORY CONFLICT

In order to resolve the problems created by the conflicting provisions contained in Sections 113(d) and 120(a)(2)(B), the Agency proposes the following:

1. No administratively issued DCOs would be issued by EPA or a State under Section 113(d)(1) that provided in any manner for compliance after July 1, 1979, or three years after the applicable SIP compliance date.

2. Federal or State court orders, whether consent decrees or litigated dispositions, that provide for compliance beyond this period would potentially make a source eligible for an exemption, provided they were reviewed by EPA and found to satisfy the criteria specified in Section 113(d). The source must also show, upon application for the exemption, that the inability to comply arose from reasons entirely beyond the control of the owner or operator of such source or of any affiliated person.

In order to satisfy the criteria set forth in Section 113(d), the order must contain an expeditious compliance schedule, require compliance with interim requirements, provide for emission monitoring and reporting, and notify the source that, unless exempted by EPA, it would be required to pay a noncompliance penalty. Finally, all orders would have to be final; that is, a source could not seek an exemption from the noncompliance penalty on the basis of an unconsented judicial order or decree if it was appealing that order or decree. EPA will not enter into consent decrees unless they satisfy these criteria. Thus, EPA review will be limited to State consent decrees, as well as federal and State unconsented orders.

There are two provisions of Section 113(d) that the judicial order would not have to satisfy to be approvable by EPA. First, it would not have to be made subject to public notice and comment. Also, it would not have to require final compliance by July 1, 1979. As noted earlier, Congress plainly sought to limit EPA's discretion to issue enforcement orders that extended beyond certain specified dates. Judicial orders, however, present less risk of the abuses Congress had in mind. Indeed, Congress did not directly address post-1977 judicial orders at all.

We believe that this proposal reflects Congress' intent in enacting these sections of the Act. Prohibiting the issuance of administrative DCO's that extend beyond July 1, 1979, responds to Congress' concern that open-ended administrative compliance orders, whether issued by States or EPA, carry with them an unacceptable risk of undermining the statutory compliance scheme. Allowing sources to petition for an exemption based upon a judicial decree responds to Congress' concern that some vehicle for providing relief to sources that meet the substantive conditions of the Section 120(a)(2)(B)(iv) exemption be provided beyond July 1979. However, the decision to grant any order which would enable the Agency to consider a source for relief under Section 120(a)(2)(B)(iv) would have to be made by a court, not by the Agency directly, and would be subject to the oversight and enforcement powers of the court. This would ensure that the procedural door to any such exemption would be more tightly held than if committed to Agency discretion alone.

The requirement for EPA determination of consistency of court orders with Section 113(d) is included for two reasons. First, it is EPA's position that court orders and consent decrees entered after the effective date of the Clean Air Act Amendments of 1977 must comply with the substantive requirements of Section 113(d), except that they need not provide for final compliance by July 1, 1979. That section set standards for all administrative orders issued in the future, and required all court orders and administrative orders issued in the past to be conformed to those standards; it is consistent with the Congressional policy embodied in these measures to read those requirements as applicable to court orders to be issued in the future as well. Second, it is a fundamental premise of Section 120(a)(2)(B) that all exemptions under it must be preceded by the issuance to the source of some other formal document which EPA (or, in the case of an exemption under Section 120(a)(2)(B)(v) [energy emergencies authorized by Section 110(f)], the President) has expressly approved.

It is important to note that the judicial decree or order by itself would not exempt the source from the noncompliance penalty. It would, however, enable the source to petition EPA for such relief. Only if EPA determined, in accordance with the criteria set forth in Section 66.31 of the regulations, that the source's inability was for reasons entirely beyond its control would the exemption be granted.

C. WHAT CONSTITUTES INABILITY TO COMPLY FOR REASONS ENTIRELY BEYOND THE CONTROL OF THE SOURCE

The second major eligibility criterion for an exemption under Section 120(a)(2)(B)(iv) relates to the source's inability to comply. The statute provides that in order to qualify for an exemption, the source must demonstrate that its inability to comply was for reasons entirely beyond the control of the owner or operator of such source or of any entity controlling, controlled by, or under common control with the owner or operator of such source. Language in the House Committee Report discussing H.R. 6161, the Clean Air Act Amendments of 1977, indicates that the (B)(iv) exemption "should be construed narrowly, so as not to open a loophole or defeat the purposes" of the penalty program.[10] The Report specifies only embargoes, strikes, fires, natural disasters, and the complete impossibility fo a supplier or contractor to furnish materials necessary to achieve compliance as situations that are entirely beyond the control of the source, but indicates that some other situations

[7] H.R. Rep. No. 95-564 95th Cong., 1st Sess. 133 (1977).

[8] Senate Report at 48.

[10] House Report at 76.

might also qualify for an exemption.[11] Such situations should arise infrequently. Section 66.31 of the proposed regulations specifies the criteria that the Agency would consider in evaluating exemption requests based on fires, strikes, natural disasters, embargoes, and the complete impossibility of a supplier to furnish needed goods. To qualify for the exemption, the source must demonstrate that it had done nothing to encourage the situation that prevented its compliance. Additionally, the source must demonstrate that the procurement of any needed pollution control equipment has been and is being given the highest priority in the source's planning and budgeting process, and that the source has been and is taking all available steps to minimize its emissions.

In addition to the circumstances clearly specified in the legislative history of Section 120, there may be other situations that the Agency would consider as being entirely beyond the control of the source. A possible ground for exemption might arise if a source were subject to a SIP requirement that has not been achieved despite installation of all available control equipment. Cases of true technological impossibility are extremely rare. In addition, one of the major premises of the Clean Air Act is that the State may require a source to research and develop the technology necessary to achieve SIP standards, or else shut down. This technology-forcing aspect of the Act has been recognized by the courts. (*See, e.g., Union Electric Co.* v. *EPA*, 427 U.S. 246 (1976)).

Whether Congress, for the purposes of the noncompliance penalty program, intended to depart from this technology-forcing philosophy is uncertain. The House Committee on Interstate and Foreign Commerce indicated that the absence of any adequately demonstrated pollution control equipment would constitute grounds for an exemption from the noncompliance penalty, provided that the source "had made maximum feasible efforts to research and develop the necessary technology or to assist some other persons to do so.[12] Senator Muskie, however, in discussing the Conference Report accompanying the 1977 Amendments, emphasized that claims that technology is not available to meet a certain emission standard would not exempt a source from the penalty.[13]

While the House and Senate differed somewhat in their discussions of this question, both recognized that a source should not be totally exempted from the noncompliance penalty by reason of its being subject to a technologically impossible SIP requirement. The language in the House Report suggests that the source must be doing everything possible to find a means of achieving the SIP standards even to be considered for an exemption. While Senator Muskie apparently understood that no exemption based on technological impossibility would be available under any circumstances, the difference between these two approaches is, as a practical matter, small. If there is no control equipment adequate to achieve compliance with the SIP, the Agency or State would be unable to determine accurately the costs being avoided by the noncomplying source. EPA believes that the only penalty the Agency could assess in this situation would necessarily be based upon the costs associated with the installation of all available controls, as determined on a case-by-case basis, as well as a commitment to an appropriate research and development (R&D) program designed to develop the new means of emission control necessary to achieve the standards. A source that, at the time the SIP requirement was first promulgated, had taken, and was continuing to take all possible steps to achieve compliance including the installation of the best available controls and, where appropriate, by commencing an EPA approved and supervised R&D program, would be considered to be deriving no economic benefit from its failure to comply and would, therefore, be exempt from the penalty, provided it had received a DCO or judicial order. These interim conditions should be incorporated into DCO or judicial order and would thus be enforceable under Section 120(a)(2)(A)(iii). Sources not meeting these criteria would be assessed a penalty based upon the costs avoided by reason of their failure to take these steps. We solicit comment on the appropriateness of this approach.

A related issue is whether a source that is experiencing severe economic difficulties could be exempted from the penalty. The legislative history is unclear on this point. The 1977 Senate Report states that the cost associated with controlling a facility would not constitute a defense to the penalty.[14] The 1976 House bill, however, provided that the term "inability to comply" included an inability to obtain financing due to temporary conditions in capital markets.[15] This standard was incorporated into the inability to comply standard adopted by the 1977 House Committee.[16] The House Committee's "inability to comply" standard was adopted by the Conference Committee.

The Agency's believes that granting an exemption based on the source's inability to obtain financing would be appropriate in certain, limited circumstances. To qualify for this exemption, the source would have to demonstrate that its inability to obtain capital resulted from temporary, verifiable market conditions. Merely being a poor loan risk would not entitle the source to an exemption. Finally, in no event could an exemption be granted if capital is available to the source owner or operator for the purpose of improvement or expansion of the existing production capacity, or for construction of new production capacity. We solicit comment on the appropriateness of its approach.

De Minimis Exemptions

Section 120(a)(2)(C) provides that an exemption is also available if the Administrator determines, after notice and opportunity for a public hearing, that a source's noncompliance is *de minimis* in nature and duration. The criteria that the Administrator will utilize in evaluating whether a particular violation is *de minimis* are set forth in Section 66.32 of the regulations. These include the magnitude of the noncompliance, whether such noncompliance is of a recurring nature, the steps being taken to minimize the emissions, and the extent to which the source has derived an economic advantage from its noncompliance.

The Agency has decided to include within the *de minimis* exemption violations that are caused by a sudden and unavoidable breakdown of process or air pollution control equipment. Section 66.33 of the regulations specifies the criteria the source must satisfy to be granted an exemption based upon an equipment malfunction. These include a finding that the source's pollution control equipment was designed, operated, and maintained properly, that all practicable steps were taken to minimize the amount and duration of the excess emissions, and that the source has not gained a significant economic advantage from the breakdown. The Agency encourages comments on the desirability of including such malfunctions within the *de minimis* exemption, as well as on the criteria that the Administrator should use in evaluating exemption requests based on malfunctions.

Federally and Municipally Owned Facilities

The Agency also considered whether municipalities and federal facilities should be exempt from the noncompliance penalty. It is anticipated that

[11] *Id.*

[12] House Report, FN at 76, *See also id.* at 66.

[13] 123 Cong. Rec. S. 13698-99 (daily ed. Aug. 4, 1977) (remarks of Sens. Muskie and Stafford).

[14] Senate Report at 50.

[15] H.R. Rep. No. 94-1175 94th Cong., 2d Sess. 42 (1976).

[16] House Report at 59.

municipalities may argue that their sources are not profit-making in the same sense that commercial facilities are. Secondly, federal facilities may argue that assessment of the penalty against them would be a meaningless exercise since the money involved will be paid by, as well as received by, the U.S. Treasury, unless the State has been delegated the program.

The Agency believes that in enacting Section 120, Congress intended to recover the out-of-pocket savings accruing to any source from its failure to install pollution controls, unless such source is specifically exempted. No exemption was created for either federal facilities or municipalities; in fact, the Congress strongly indicated its intention that federal facilities be treated the same as other sources of air pollution in the amendment to Section 118 of the Act.

Under this reading, federal facilities and municipalities should be subject to noncompliance penalties unless one of the specified exemptions is applicable. We invite comment on this issue.

V. Administrative and Judicial Review

A. Adjudicatory Hearings

If a source wishes to challenge the finding of noncompliance that led to issuance of the notice of noncompliance, or to claim entitlement to an exemption, it may petition for a hearing. The Administrator or delegated State authority may then either withdraw the notice, grant the hearing, or deny the request if the source has not raised any significant questions. Where a hearing is graned, it will be of an adjudicatory nature except as otherwise provided, and will be conducted in accordance with the Agency's Consolidated Rules of Practice (40 CFR Part 22). Hearings of this type are also available where a source's penalty submittal is recalculated by the Agency and after a final adjustment.

B. Informal Hearings

The Act provides that hearings to determine whether a source should be exempted because its noncompliance is *de minimis* will be informal in nature. Such hearings need not meet the requirements of the Consolidated Rules. A source applying for a *de minimis* exemption must submit information sufficient, in the opinion of the Administrator, to justify the request. In determining whether an exemption is justified, the Administrator will consider the factors set forth in the regulations. If the Administrator determines that the source has not supported its exemption request with sufficient information, a hearing will be denied.

Finally, where a State has been delegated the noncompliance penalty program, its hearings on challenges to notices and exemption requests may be informal so long as the conditions established in Section 67.11 of the Regulations are met. Where a State hearing was held, any EPA hearing to review State exemption decisions or penalty assessments may be of an informal nature.

C. Judicial Review

Several EPA decisions under these regulations can be appealed to the appropriate United States Court of Appeals. The first of these is the finding of violation that leads to the issuance of the notice of noncompliance. The second is a decision to deny an exemption request. In addition, revision by EPA of a penalty schedule submitted by a source, either at the start of the penalty assessment process or at the time of final adjustment, may be appealed. Such decisions are appealable only if all administrative remedies, including appeal to the Administrator, have been exhausted.

VI. State Involvement

A. Delegatons

Part 67 deals with State involvement in assessing and collecting noncomliance penalties. EPA encourages all States that are interested in the program to seek delegation of it as soon as possible. Penalties assessed by a State will be paid into that State's Treasury.

In order to be delegated the authority to administer this program, a State must request a delegation by describing its proposed program. The request must indicate the availability of adequate staff and funds and the capability for conducting the necessary financial analysis and administrative hearings. Where specific assistance from EPA will be necessary, the State request should so indicate.

After a State delegation is in effect, the Agency will retain concurrent authority to assess and collect a penalty against any source within that State that is subject to the penalty and against which the State has failed to take appropriate action. Where the Administrator determines that a source has been overlooked, or that other steps subsequent to the issuance of a notice of noncompliance have not been taken, he will notify the State to that effect. If the State does not take corrective action within thirty days, the Agency will do so.

Provision is also made in the regulations for review of State exemption decisions and penalty assessments. Where the Administrator disapproves a State action, the Agency will then take whatever steps are necessary to assess the penalty against that source in accordance with these regulations. If the Administrator determines that the State has repeatedly failed to administer the program as required in the guidelines set out in the regulations, he shall so notify the State, setting forth the reasons for such a determination. The State may then respond and demonstrate that it is in fact acting in conformity with these guidelines or that it is taking reasonable steps to meet those guidelines. If the State cannot so demonstrate, the Administrator will withdraw the delegation and implement the program.

VII. Public Hearings on This Proposal

Public comment is invited and will be received until June 19, 1979. EPA has decided to provide a 90 day comment period, rather than the normal 60 days, because of the extremely technical nature of this proposal. We believe that this 90 day period provides the public with adequate time to analyze and comment upon these proposed regulations. Because the Clean Air Act requires that the noncompliance penalty program take effect on August 7, 1979, EPA will not be able to provide any further extension of the comment period. Comments should be addressed to:

Director, Division of Stationary Source Enforcement (EN-341), U.S. Environmental Protection Agency, 401 M Street SW., Washington, D.C. 20460.

Informal (legislative) public hearings on these proposed rules will be held at the following times and places:

Conference Room 2409, 2126, U.S. Environmental Protection Agency, 401 M Street SW, Washington, D.C.—May 3 and 4.

Adams Room, Midland Hotel, 172 W. Adams, Chicago, Illinois—May 7 and 8.

Sixth Floor Conference Room, U.S. Environmental Protection Agency, 2153 Fremont Street, San Francisco, California—May 10 and 11.

All hearings on the first day will commence at 9:30 A.M. with an evening session beginning at 7:30 P.M. On the second day hearings will commence at 9:30 A.M. and conclude when appropriate.

A presiding officer and panel will be designated for each hearing. The presiding officer will have the responsibility for maintaining order, excluding irrelevant or repetitious material, scheduling presentations and, to the extent possible, notifying the participants of the time at which they may appear. The hearings will be conducted informally. Technical rules of evidence will not apply.

Interested persons wishing to make a statement at the hearing will be afforded the opportunity to do so. The time for making a statement will be limited. Such persons are requested to file a notice of their intent to make a statement no later than ten days prior to the hearing and, no later than five days prior to the hearing, if practicable, to submit five copies of the proposed statement to Robert Homiak at the above address (telephone: 202-755-2580). All other inquiries and comments prior to and after the hearing should be addressed to the same. The record of each public hearing will remain open for thirty days following the completion of that hearing for the submittal of rebuttal and supplementary information.

The documents on which this proposal is based are contained in Docket Number EN-79-1. All comments received during the comment period will be promptly added to the docket, and all documents upon which the final rules are based will be included in the docket. The docket will be open for public inspection between 8:00 a.m. and 4:00 p.m. Monday through Friday at:

U.S. Environmental Protection Agency, Central Docket Section, Room 2903B, Waterside Mall, 401 M Street, S.W., Washington, D.C. 20460.

Interested persons are reminded that Section 307(d)(7)(B) of the Act provides that objections to proposed rules must be raised with reasonable specificity by public comments for those objections to be cognizable during judicial review. In the view of EPA, this requires comments of a technical nature to be accompanied by sufficiently detailed supporting documentation to permit the Agency's technical staff to evaluate the comments in detail. This is particularly important where the information necessary to evaluate the comments properly is in the control of the commenters.

In addition, a regulatory analysis of the impact of these regulations has been prepared as required by Executive Order 12044. Copies of this analysis entitled "The Economic Effects of Noncompliance Penalties Under Section 120 of the Clean Air Act" may be obtained from the Agency's Central Docket Section, at the above address.

Copies of the Agency's "Plan For Evaluating the Effects of the Noncompliance Penalty Program" may also be obtained from the Director, Division of Stationary Source Enforcement at the above address. This evaluation is required by Executive Order 12044, and will be conducted in mid-1984, five years after these regulations become effective.

Finally, in accordance with the provisions of Executive Order 12044, these proposed regulations have been distributed to State and local air pollution control groups for their review and comments.

(Section 120 of the Clean Air Act, as amended, 42 U.S.C. 7420)

DOUGLAS M. COSTLE,
Administrator.

MARCH 9, 1979.

Title 40 of the Code of Federal Regulations is proposed to be amended by adding new Parts 66 and 67 as set forth below:

PART 66—ASSESSMENT AND COLLECTION OF NONCOMPLIANCE PENALTIES

Subpart A—Purpose and Scope

Sec.
66.1 Applicability.
66.2 Program description.
66.3 Definitions.
66.4 Re-examination of positions taken.
66.5 Savings clause.

Subpart B—Notice of Noncompliance

66.11 To whom notices must be sent.
66.12 Timing of notices of noncompliance.
66.13 Contents of notices of noncompliance.
66.14 Duties upon receipt of a notice of noncompliance.

Subpart C—Calculation of noncompliance penalties

66.21 How to calculate the penalty.
66.22 Contracting out penalty calculation.

Subpart D—Exemption Requests

66.31 Exemptions based on an order, extension or suspension.
66.32 De Minimis exemptions.
66.33 Excess emissions/upsets.
66.34 Revocation of exemptions.

Subpart E—Decisions on Exemption Requests and Challenges to Notices of Noncompliance

66.41 Petitions.
66.42 Decision on petitions.
66.43 Procedures for hearing.
66.44 Final decision.

Subpart F—Review of Penalty Calculation

66.51 Review of assessments.
66.52 Hearing requests.
66.53 Decisions on hearing requests.
66.54 Procedures for hearing.
66.55 Adjustment of penalty.

Subpart G—Payment

66.61 Duty to pay.
66.62 Method of payment.
66.63 Late payment penalty.

Subpart H—Compliance and Reimbursement

66.71 Determination of compliance.
66.72 Additional payment or reimbursement
66.73 Hearing requests.
66.74 Payment or reimbursement.

Subpart I—Final Action

66 81 Final action.

Subpart J—Supplemental Rules for Formal Adjudicatory Hearings

Sec.
66.91 Scope of these supplemental rules.
66.92 Beginning of hearings.
66.93 Time limits.
66.94 Burden of presentation; burden of persuasion.
66.95 Issues for hearings.
66.96 Penalty assessed.
66.97 Appeals from or review of initial decision.

AUTHORITY: Section 120 of the Clean Air Act, as amended, 42 U.S.C. 7420

Subpart A—Purpose and Scope

§ 66.1 Applicability.

This Part applies to all proceedings for the assessment by EPA of a noncompliance penalty as provided by Section 120 of the Clean Air Act. This penalty is designed to remove the economic advantage which might otherwise accrue to a source by reason of its failure to comply with air pollution control standards after mid-1979.

§ 66.2 Program description.

This Part sets forth the procedures by which EPA will administer the noncompliance penalty provisions of Section 120 of the Clean Air Act. Subpart B states which sources of air pollution are subject to these penalties and the form and substance of the notice of noncompliance. Subpart C and the accompanying Technical Support Document and Manual state how a source must compute the penalty which it owes. Subpart D describes the conditions for which an exemption from the penalty may be available, and Subpart E sets forth the procedures for requesting such an exemption. Subpart F states how EPA will review penalties calculated by sources under Subpart C, and Subpart G describes the method of payment. Subpart H provides for adjustment of the penalty after the source has come into compliance and the actual costs of doing so are known. Finally, Subpart I states EPA's position on which actions under these regulations are subject to judicial review and on what conditions, and Subpart J provides supplemental procedures for adjudicatory hearings.

§ 66.3 Definitions.

In this part and Part 67:

(a) "Act" means the Clean Air Act, 42 U.S.C. 7401 et seq.

(b) "Affiliated person" means a person who directly, or indirectly through one or more intermediaries, controls, is controlled by, or is under common control with the owner or operator of a source within the meaning of Section 120 of the Act.

(c) "Applicable legal requirements" means any of the following:

(1) In the case of any major source, any emission limitation, emission standard, or compliance schedule

under any applicable implementation plan (regardless of whether the source is subject to a Federal or State consent decree);

(2) In the case of any source, an emission limitation, emission standard, standard of performance, or other requirement (including, but not limited to, work practices) established under Section 111 or 112 of the Act;

(3) In the case of a source which is subject to an extension, order, or suspension described in Section 66.31 which has resulted in an exemption from noncompliance penalties, any interim emission control requirement or schedule of compliance under that extension, order or suspension.

(4) In the case of a nonferrous smelter which has received a primary nonferrous smelter order under Section 119 of the Act, any interim emission control requirement or schedule of compliance under that order.

(d) "Computer Program" means the computer program that EPA will use to calculate noncompliance penalties under Section 120 of the Clean Air Act. This computer program appears as Appendix C to these regulations.

(e) "Control" (including the terms "controlling," "controlled by" and "under common control with") means the power to direct or cause the direction of the management and policies of a person or organization, whether by the ownership of voting securities, by contract or otherwise.

(f) "Major stationary source" means any stationary facility or source of air pollutants which, at full capacity, and in the absence of air pollution control equipment, directly emits, or has the potential to emit, one hundred tons per year or more of any air pollutant regulated under the Clean Air Act (including fugitive emissions). "Air pollution control equipment" includes control equipment which is not, aside from air pollution control laws and regulations, vital to production of the normal product of the source or to its normal operation.

(g) "Manual" means the "Noncompliance Penalties Instruction Manual" which accompanies these regulations. This Manual appears as Appendix B to these regulations.

(h) "Owner or operator" means any person who owns, leases, operates or supervises a facility, building, structure or installation which emits any air pollutant regulated under the Act.

(i) "Source" means any source of air pollution subject to applicable legal requirements as defined in paragraph (c).

(j) "Technical Support Document" means the "Noncompliance Penalties Technical Support Document" which accompanies these regulations. The Technical Support Document appears as appendix A to these regulations.

All other terms are defined as they are in the Act.

§ 66.4 Reexamination of positions taken.

(a) No conclusions expressed in this Part or Part 67 may be re-examined in any agency hearing conducted under this Part or Part 67.

(b) This bar on re-examination includes, but is not limited to, the situations described in (1), (2), and (3) below.

(1) No exemptions may be granted unless explicitly authorized by these regulations. Arguments that the statute is more or less restrictive than the regulations will not be considered in any subsequent agency proceeding.

(2) When penalty calculations are at issue, only the accuracy of the inputs to the calculation model which are specific to that particular source, as set forth in the Manual and the Technical Support Document, may be challenged in an agency hearing. Neither the terms and conditions of the model nor the conclusions as to what form of evidence will be considered in deciding on the accuracy of a particular input not specific to the source will be re-examined in individual proceedings.

(3) Sources are free to use methods of penalty calculation other than the Computer Program, if such methods are consistent with the Manual and Technical Support Document. (See Appendices A–C for these documents). However, any such method of calculation that gives results different from the Computer Program in the case being calculated is automatically unacceptable.

§ 66.5 Savings clause.

Imposition of a penalty under Section 120 is in addition to, and not in substitution for, any other permits, orders, payments, sanctions or other requirements of State or Federal law. No action under this Part or Part 67 shall affect in any way an civil or criminal enforcement proceeding brought under any provision of the Clean Air Act or State or local law.

Subpart B—Notice of Noncompliance

§ 66.11 To whom notices must be sent.

(a) The Administrator shall send a notice of noncompliance to any source located in a State without a Section 120 program approved under Subpart B of Part 67 which is in violation of applicable legal requirements.

(b) The Administrator shall send a notice of noncompliance to any source located in a State with a Section 120 program approved under Subpart B of Part 67 when he determines as provided in § 67.21 that the source is in violation of applicable legal requirements and the State has failed to send a notice of noncompliance to it, or has failed to diligently prosecute any subsequent steps for the assessment or collection of the penalty.

(c) A source is in violation of applicable legal requirements on the day it fails to comply with them in their officially issued or promulgated form. The existence of any pending litigation or judicial or administrative stays of the regulation shall not affect the issuance of a notice of noncompliance.

§ 66.12 Timing of notices of noncompliance.

(a) Notices of noncompliance in States without EPA approved Section 120 programs shall be issued by EPA on or before the later of:

(1) August 7, 1979; or

(2) Thirty days after EPA determines that a source is in violation of applicable legal requirements.

(b) Notices of noncompliance in States with EPA approved Section 120 programs shall be issued by EPA when the Agency determines, in accordance with § 67.21, that the State has failed to issue a satisfactory notice of noncompliance or to diligently prosecute any subsequent step for assessing or collecting the penalty.

(c) Failure of EPA to issue a notice of noncompliance within the time limits set forth above shall not affect the obligation of a source to pay a noncompliance penalty but shall affect the date from which the penalty is calculated. The noncompliance penalty shall in all cases be calculated from the later of:

(1) August 7, 1979, where the notice of noncompliance was sent on or prior to that date; or

(2) The date the notice of noncompliance under this section was issued to the source.

§ 66.13 Contents of notices of noncompliance.

(a) Each notice of noncompliance shall be in writing and shall include:

(1) A specific reference to each applicable legal requirement of which the source is in violation;

(2) A concise statement of the factual basis for the finding of violation, together with a citation to any necessary supporting materials and a statement of when and where they may be inspected;

(3) Instructions on how to calculate the amount of the penalty owed and the schedule for payments, including (i) a statement of the date from which penalties should be calculated and (ii) a copy of the Technical Support Document and the Manual; and

(4) Notice of the right to petition for a hearing to challenge the finding of noncompliance or to claim an exemption as provided in Subpart D.

(b) Each notice of noncompliance shall be transmitted to the source

named either by personal service or by registered or certified mail, return receipt requested.

§ 66.14 Duties upon receipt of a notice of noncompliance.

Within forty-five days after receiving a notice of noncompliance under this Part a source shall either:

(a) Calculate the amount of the penalty owed and the appropriate quarterly payment schedule, and transmit that calculation, together with the necessary data for verification, to the Administrator as provided in the Manual; or

(b) Submit a petition alleging either that the source is not in violation of applicable legal requirements or that it is entitled to an exemption as provided in §§ 66.31 through 66.33.

Subpart C—Calculation of Noncompliance Penalties

§ 66.21 How to calculate the penalty.

All noncompliance penalties shall be calculated in accordance with the Technical Support Document and the Manual, and by a method that gives the same results as the Computer Program.

§ 66.22 Contracting out penalty calculation.

If any person who is required by § 66.14 to submit (a) a calculation of the penalty assessment, (b) a schedule for payment, and (c) the data necessary for an independent verification of (a) and (b), fails to submit any of these materials in the time specified by that section or submits them in a form other than the one required by the Technical Support Document and the Manual, the Administrator may enter into a contract with any qualified person who is not an affiliated person to assist in determining the amount of the penalty assessment or payment schedule with respect to such source. The cost of carrying out this contract shall be added to the penalty to be assessed against the owner or operator of the source.

Subpart D—Exemption Requests

§ 66.31 Exemptions based on an order, extension or suspension.

(a) A source that would otherwise be subject to a noncompliance penalty under the standards set forth in Subpart B will be exempted from that penalty during the period for which and upon a demonstration that its noncompliance with applicable legal requirements is due solely to:

(1) A conversion by such source from the burning of petroleum products or natural gas, or both, as the permanent primary energy source to the burning of coal pursuant to an order under Section 113(d)(5) or Section 119 of the Clean Air Act as in effect before the date of enactment of the Clean Air Act Amendments of 1977.

(2) In the case of a coal-burning source, the issuance of a prohibition to that source against burning petroleum products or natural gas, or both, by means of an order under Sections 2(a) and (b) of the Energy Supply and Environmental Coordination Act of 1974 or under any legislation which amends or supersedes these provisions, *provided* that to qualify for an exemption under this subparagraph the source must also have received an extension under the second sentence of Section 119(c)(1) as in effect before the date of enactment of the Clean Air Amendments of 1977.

(3) The use of innovative technology by the source pursuant to an enforcement order under Section 113(d)(4).

(4) An inability to comply with an applicable legal requirement resulting from reasons entirely beyond the control of the owner or operator of such source or of any affiliated person, *provided* that in order to qualify for an exemption under this subparagraph, the source must demonstrate that its inability to comply resulted from reasons entirely beyond the control of its owner or operator or any affiliated person and that it has received an order under Section 113(d) (or an order under Section 113 issued before the date of enactment of this section) or a Federal or State judicial decree or order which has the effect of permitting a delay or violation of the legal requirement at issue. Additionally, the source must meet the requirements of paragraphs (c) and (d) of this section.

(5) Existence of an energy or employment emergency demonstrated by issuance of an order under Section 110(f) or 110(g).

(b) To qualify for an exemption under this section, the source in question must demonstrate in its § 66.14 petition that it has received the order, extension or suspension described in the subparagraph under which the exemption is claimed. No exemption will be granted that goes beyond the terms of the relevant extension, order, or suspension. No exemption will be granted based on a claim that the source is entitled to any such order, extension or suspension even though it has not received it.

(c) In any exemption claim based on subparagraph (a)(4) above, the source must demonstrate to the satisfaction of the Administrator that the inability to comply resulted from one of the following situations:

(1) Natural disaster;

(2) Fire;

(3) Embargo;

(4) Strike; or

(5) The complete impossibility of a supplier or contractor to furnish materials necessary to achieve compliance, provided it can be demonstrated:

(i) That the source owner or operator or other affiliated person in no manner caused, encouraged or contributed to the impossibility; and

(ii) That the source in no way unduly delayed negotiation for needed equipment or fuel supply by making unusual demands not typical of contract negotiations in its industry, by placing unusual restrictions on the supplier, or by delaying in any other manner the completion of the necessary construction or delivery.

(d)(1) In any demonstration under paragraph (c), the source also has an affirmative burden to show that all reasonable steps were taken to prevent the situation causing the inability to comply, that procuring the needed pollution control equipment or fuel supply has been and continues to be given the highest priority in the source's planning and budgeting process, and that alternative sources of fuel supply have been explored.

(2) Any exemption granted under subparagraph (a)(4) may include a requirement that the source accelerate its schedule for compliance in any manner that the Administrator shall provide.

(3) Any exemption granted under subparagraph (a)(4) shall insulate the source from liability for the penalty only so long as the inability to comply continues to be beyond the control of the source as defined in this section.

§ 66.32 De minimis exemptions.

(a) The Administrator may exempt any source from the penalty where he finds that the noncompliance of that source is de minimis in nature and duration.

(b) Where a source issued a notice of noncompliance submits a petition pursuant to § 66.14 alleging an exemption based on a claim of de minimis violation, the source must include information sufficient, in the opinion of the Administrator, to justify a finding that the instance of noncompliance is de minimis in both nature and duration.

(c) In ruling upon such a petition, the Administrator will consider the following factors:

(1) The magnitude of the noncompliance and whether such noncompliance is of a recurring or persistent nature;

(2) What steps the source is taking to minimize the problem and the resulting excess emissions; and

(3) Whether any significant economic savings are likely to accrue to the source as a result of the noncompliance.

(d) Where a hearing is granted under § 66.42 on any petition filed under § 66.14 alleging an exemption

under this section, such hearing shall be informal and of a legislative nature.

§ 66.33 Excess emissions/upsets.

(a) Where the noncompliance of a source is caused solely by a sudden and unavoidable breakdown of process or air pollution control equipment, the Administrator may determine that such noncompliance is de minimis.

(b) A source claiming such an exemption must submit in its § 66.14 petition information sufficient, in the opinion of the Administrator, to demonstrate the following:

(1) The air pollution control equipment, process equipment, or processes, including appropriate back-up systems, were at all times designed, maintained and operated, to the maximum extent practicable, in a manner consistent with good practice for minimizing emissions;

(2) Repairs were made in an expeditious fashion when the operator knew or should known that applicable emission limitations were being exceeded. Off-shift labor and overtime must have been utilized to ensure that such repairs were made as expeditiously as possible;

(3) The amount and duration of the excess emissions (including any bypass) were minimized to the maximum extent practicable during periods of such emissions;

(4) All practicable steps were taken to minimize the impact of the excess emissions on ambient air quality;

(5) The excess emissions are not part of a recurring pattern indicative of inadequate design, operation, or maintenance; and

(6) No significant economic savings to the source have resulted.

(c) Any activity which can be foreseen and avoided or planned for shall not constitute grounds for an exemption under this section. Such activities include, but are not limited to, sudden breakdowns avoidable by better maintenance precedures, phasing in and out of process equipment and routine maintenance.

(d) Where a hearing is granted under § 66.42 on any petition filed under § 66.14 alleging an exemption under this section, such hearing shall be informal and of a legislative nature.

§ 66.34 Revocation of exemptions.

(a) The Administrator may move to revoke any exemption granted to any source at any time.

(b) An exemption may be revoked if:

(1) The grounds for it no longer exist or never did exist, or

(2) in the case of an exemption under § 66.31, the source has failed to comply with any interim emission control requirements or schedules of compliance (including increments of progress) under any extension, order or suspension on which the exemption was based.

(c) If the Administrator decides to move to revoke an exemption, he shall provide the source written notice containing both the information required by § 66.13 and a statement of why the provisions of paragraph (b) of this section apply. The notice shall be transmitted as required by § 66.13 and the source shall respond to it as provided for notices of noncompliance by § 66.14.

Subpart E—Decisions on Exemption Requests and Challenges to Notices of Noncompliance

§ 66.41 Petitions.

(a) Any petition filed under § 66.14 alleging either that a source is not in violation of applicable legal requirements or that it is entitled to an exemption under Subpart D shall either contain or be physically accompanied by a complete statement of the legal, factual, and policy arguments on which the source relies, including all necessary supporting data. No such petition shall raise issues or arguments extraneous to the questions of compliance or entitlement to an exemption.

(b) For purposes of these regulations, the existence of an outstanding unsatisfied enforcement order or judicial decree governing a source shall be *prima facie* evidence that the source is out of compliance with applicable legal requirements.

§ 66.42 Decision on petitions.

Within thirty days after receiving a complete petition under § 66.41 the Administrator shall:

(a) Withdraw or modify the notice of noncompliance to the extent he concludes that the source is clearly entitled to the relief it has requested;

(b) Deny a hearing and affirm the notice to the extent he concludes that the source has not raised any significant questions of material fact that might affect the terms of the notice of noncompliance; or

(c) Grant a hearing under §§ 66.31, 66.32, 66.33 or 66.34, or on the issue of whether the source is in violation of applicable legal requirements, to the extent he concludes that the source has raised such questions.

§ 66.43 Procedures for hearing.

(a) Except as provided in §§ 66.32 and 66.33, hearings granted under § 66.42(c) shall be held as provided in Subpart J.

(b) If hearings are requested and granted under both §§ 66.32 or 66.33 and under Subpart J, no separate hearing under §§ 66.32 or 66.33 shall be held. The issues that would otherwise have been considered at that hearing shall be considered at the hearing under Subpart J.

§ 66.44 Final decision.

Within forty-five days after EPA has made a final Agency decision to deny a source's exemption request or allegation that it is not in violation with applicable legal requirements, the source shall submit the penalty calculation required by § 66.14(a) in accordance with the Technical Support Document and the Manual, including the instructions for accelerated payment schedules and extra interest to make up for any delay. The penalty runs from the date of the original notice.

Subpart F—Review of Penalty Calculation

§ 66.51 Review of assessments.

(a) Within thirty days after receipt of a source's penalty calculation under §§ 66.14(a) or 66.44, the Administrator shall respond in writing, in accordance with one of the options described in (1) through (3) below, that:

(1) The penalty will be accepted as calculated, but without prejudice to any recalculation that may be called for under Section 66.72 after the source has achieved compliance.

(2) The penalty has been recalculated based on the data provided by the source. The Administrator shall furnish the source a brief statement of the basis of the recalculation and inform it when and where any supporting data may be examined. The Administrator shall also notify the source of its right to petition for a hearing under Section 66.52.

(3) The source has not submitted enough material to enable EPA to make a satisfactory independent verification of the penalty calculation. The Administrator shall specity what deficiencies exist and require the source to furnish the missing material within fifteen days of receipt of that notification. If no further submission is made within this time, EPA may calculate the penalty as provided in § 66.22.

(b) Any missing material furnished under subparagraph (a)(3) of this section shall be evaluated as provided in paragraph (a) just as if it were an original penalty calculation.

§ 66.52 Hearing requests.

Within forty-five days after receipt of notice under Section 66.51(a)(2) that its penalty has been recalculated, a source may request in writing a hearing to challenge the Administrator's assessment. Any such petition shall either contain or be physically accompanied by a complete statement of the legal, factual, and policy arguments on which the source relies, including all necessary back-up data.

§ 66.53 Decisions on hearing requests.

Within thirty days after receiving a hearing request under § 66.52 the Administrator shall:

(a) Accept the source's version of the penalty calculation to the extent he concludes it is clearly correct;

(b) Deny a hearing and affirm the calculation to the extent he concludes that the source has not raised any significant questions of material fact that might affect the calculation of the penalty; or

(c) Grant a hearing under Section 66.54 to the extent he concludes that the source has raised such questions.

§ 66.54 Procedures for hearing.

(a) Except as provided in paragraph (b), hearings granted under § 66.52 shall be held as provided in Subpart J.

(b) The Presiding Officer shall schedule any hearing under this section so as to enable the initial decision to be issued within ninety days after the Administrator grants a hearing and shall issue an initial decision within that period, unless such time is extended by the Presiding Officer with the approval of the Administrator.

§ 66.55 Adjustment of penalty.

A source must pay the penalty which it has calculated under § 66.14 while proceedings to decide an agency challenge to that calculation are in progress. If a different penalty is established after Agency hearings, penalty installments will be recalculated in accordance with the Technical Support Document and the Manual to take account of the delay.

Subpart G—Payment

§ 66.61 Duty to pay.

Each source shall pay the first installment of its noncompliance penalty on the date six months after issuance of the notice of noncompliance to it or on January 1, 1980, whichever is later. Installments shall be paid quarterly thereafter. Quarters shall be measured in increments of three months from the date the first payment was due.

§ 66.62 Method of payment.

Payment of noncompliance penalties under this part shall be made by cashier's or certified check made out to the United States Treasury, sent by registered or certified mail, and addressed to the Administrator.

§ 66.63 Late payment penalty.

(a) Any source which fails to pay the penalty due under § 66.61 when it is due shall pay in addition to the penalty owed a quarterly nonpayment penalty for each quarter in which payment is not made by the due date. The penalty shall be equal to 20 percent of the aggregate amount of the penalties and nonpayment penalties accrued against that source which had not been paid on the due date. Payment is made on the due date if it is postmarked or received on or before the due date.

(b) If a nonpayment penalty becomes due, the Administrator shall notify the source to that effect in writing. Such nonpayment penalty, as well as the noncompliance penalty past due, shall be payable immediately.

Subpart H—Compliance and Reimbursement

§ 66.71 Determination of compliance.

(a) If a source which is paying a noncompliance penalty under this Part believes it has come into compliance and is maintaining compliance with all applicable legal requirements, it shall so notify the Administrator. The notice shall include all factual, analytical, and legal arguments in support of its claim, including any necessary back-up data.

(b) The Administrator shall review any notice and supporting materials submitted under paragraph (a) and shall inform the source within thirty days whether he is able to conclude on the basis of the notice and supporting materials that the source is in compliance with applicable legal requirements. If he is not able to make this conclusion, his response to the source shall briefly state the reasons why not and identify any additional material that is needed.

§ 66.72 Additional payment or reimbursement.

(a) Within 120 days after the Administrator has informed a source under § 66.71 that it has achieved and is maintaining compliance with applicable legal requirements, the source shall submit to the Administrator a revised penalty calculation as provided in the Technical Support Document and the Manual.

(b) Within thirty days after receiving a source's revised penalty calculation under paragraph (a), the Administrator shall evaluate it and shall respond in writing and state either:

(1) That the revised penalty will be accepted as calculated;

(2) That the penalty has been recalculated based on the data provided by the source. The Administrator shall furnish the source a brief statement of the basis of the recalculation and shall inform it when and where any supporting data may be examined. The Administrator shall also notify the source of its right to petition for a hearing under § 66.73; or

(3) That the source has not submitted enough material to enable EPA to made a satisfactory independent verification of the penalty calculation. The Administrator shall require the source to furnish the missing material within thirty days of receipt of the notice.

(c) If a source fails to submit a revised penalty calculation when due under this secton or the calculation it submits is inadequate, the Administrator may enter into a contract for independent calculation of the penalty as provided in § 66.22.

§ 66.73 Hearing requests.

Within forty-five days of receipt of a notice under Section 66.72(b)(2) a source may request a hearing in the form and manner provided in § 66.52. The hearing request shall be evaluated as provided in § 66.53 and any hearing shall be held in conformity with §§ 66.54 and 66.55.

§ 66.74 Payment or reimbursement.

(a) Within thirty days after any adjustment of a noncompliance penalty under this Subpart has become administratively final:

(1) If the source owes a deficiency it shall pay that deficiency as provided in § 66.62.

(2) If there has been an overpayment by the source, the Administrator shall transmit to the source a check from the United States for the deficiency by registered or certified mail, return receipt requested.

(b) Any payment under paragraph (a) shall be calculated with interest at prevailing rates from the date it should have been paid, as set forth in the Technical Support Document and the Manual.

(c) Any source which dos not make a payment under this section when it is due shall pay a penalty equal to 20% of the amount not paid for each calendar quarter or portion of a quarter for which payment was not made as provided in § 66.63.

Subpart I—Final Action

§ 66.81 Final action.

(a) Each of the following constitutes final Agency action appealable to the courts provided the conditions of paragraph (b) are met:

(1) Any finding that a source is in violation of applicable legal requirements;

(2) Any decision to deny an exemption under Subpart D;

(3) Any revision by EPA of a penalty schedule under Subpart F; and

(4) Any revision by EPA of a final penalty calculation submitted under Subpart H.

(b) The actions listed in paragraph (a) constitute final Agency action only if all administrative remedies have been exhausted. To exhaust administrative remedies a source must request

an administrative hearing where available to challenge the decision in question and must appeal or attempt to appeal any unfavorable decision to the Administrator.

Subpart J—Supplemental Rules for Formal Adjudicatory Hearings

§ 66.91 Scope of these supplemental rules.

The Supplemental Rules in this Subpart, in conjunction with the Consolidated Rules of Practice (40 CFR Part 22) shall govern all formal adjudications held under §§ 66.43, 66.54, and 66.73. Where inconsistencies exist between these Supplemental Rules, or any other provision of this Part, and the Consolidated Rules, the provisions of this Part shall govern.

§ 66.92 Beginning of hearings.

(a) Hearings under this Part shall not begin with the filing of a complaint and there shall be no complaint or answer as such. Instead, a hearing shall begin as soon as the Administrator grants a hearing under §§ 66.42, 66.53, or 66.73. 40 CFR 22.08 shall become applicable at that time.

(b) Upon granting a hearing the Administrator shall immediately transmit to the Regional Hearing Clerk two copies of the notice granting the hearing and:

(1) In the case of a hearing under § 66.42, two copies of the notice of noncompliance under § 66.13 (or the revocation notice under § 66.34) and of the petition under § 66.41, together with any supporting documents; and

(2)(i) In the case of a hearing under § 66.54, two copies of the source's penalty calculation under §§ 66.14(a) or 66.72, of the modifications to that calculation by the Agency under §§ 66.51(a)(2) or 66.72(b)(2), and of the source's petition for a hearing under § 66.52, together with any supporting documents.

(ii) The Regional Hearing Clerk shall open and maintain the official file of the proceeding upon receipt of these documents. These documents shall serve the function of the complaint and answer in other proceedings and any information they contain shall automatically be received in evidence in the hearing.

(c) Upon granting a hearing the Administrator shall immediately request the Chief Administrative Law Judge to assign an Administrative Law Judge as the Presiding Officer. The Chief Administrative Law Judge shall make this assignment within seven days of receiving the request. The Chief Administrative Law Judge shall inform the Regional Hearing Clerk when the Presiding Officer is designated and the Regional Hearing Clerk shall then promptly forward to the Presiding Officer one set of the documents described in paragraph (b).

§ 66.93 Time limits.

The Presiding Officer promptly upon designation shall schedule any prehearing conferences (or alternative procedures) under 40 CFR 22.19 and shall issue notice of hearing under 40 CFR 22.21. The Presiding Officer shall issue an initial decision no later than ninety days after the hearing is granted, and is authorized to shorten any deadline in 40 CFR Part 22 where necessary to that end.

§ 66.94 Burden of presentation; burden of persuasion.

(a) In hearings under § 66.43 the Agency has the burden of going forward and presenting evidence that the source is in violation of applicable legal requirements. Following the establishment of a *prima facie* case, the source shall have the burden of presenting and of going forward with any rebuttal evidence.

(b) In hearings under § 66.43 the source has the burden of going forward and presenting evidence that it is entitled to an exemption. Following the establishment of a *prima facie* case, the Agency shall have the burden of presenting and of going forward with any rebuttal evidence.

(c) In hearings under §§ 66.54 an 66.73 the Agency has the burden of going forward and presenting evidence that its revisions to the source's penalty calculations are correct. Following the establishment of a *prima facie* case, the source shall have the burden of presenting and of going forward with any rebuttal evidence.

(d) Each matter of controversy shall be determined by the Presiding Officer upon a preponderance of the evidence.

§ 66.95 Issues for hearings.

(a) In any hearing under § 66.43, no other issues may be raised except the question of noncompliance and the source's entitlement to an exemption.

(b) Where a source intends to claim that it is entitled to an exemption if its claim that it is in compliance with applicable legal requirements is unsuccessful, the source must raise the exemption issues in its original petition under § 66.14. The Presiding Officer shall consider all such issues so that the initial decision addresses both questions.

(c) In any hearing under § 66.54, the validity of the formulae for calculating the penalty shall not be in question. As set forth in § 66.4, only the values of those parameters which are specific to that particular source, as authorized by the Manual and the Technical Support Document, may be challenged.

§ 66.96 Penalty assessed.

(a) The dollar amount of the penalty shall be based upon the formulae contained in the Technical Support Document and the Manual. The Presiding Officer may determine the accuracy of the data submitted by the source, but may not alter the penalty amount determined by the formulae.

(b) Payment shall be made according to the schedule established under the guidelines of the Technical Support Document and the Manual.

§ 66.97 Appeals from or review of initial decision.

An appeal to the Administrator from an adverse ruling or order of the Presiding Officer shall be made within fifteen (15) days after service of the initial decision.

PART 67—EPA APPROVAL OF STATE NONCOMPLIANCE PENALTY PROGRAMS

Subpart A—Applicability

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APPENDIX A—TECHNICAL SUPPORT DOCUMENT

APPENDIX B—INSTRUCTION MANUAL

APPENDIX C—COMPUTER PROGRAM

AUTHORITY: Section 120 of the Clean Air Act, as amended, 42 U.S.C. 7420.

Subpart A—Applicability

67.1 Applicability.

This Part sets the standards and procedures under which EPA will approve State programs for assessing noncompliance penalties under Section 120 of the Clean Air Act and evaluate actions taken by States with approved programs.

67.2 Program description.

In Part 67, Subpart A covers the applicability of the Part. Subpart B states the conditions under which EPA will approve State programs to administer the nonompliance penalty provisions. Subparts C and D state when and how EPA will issue own its notices to sources in States with approved programs, and how it will review State decisions on whether to grant exemptions from the penalty. Finally, Subpart E states how EPA will review State assessments of the amount of a penalty.

Subpart B—Approval of State Programs

67.11 Standards for approval of State programs.

(a) The Administrator shall approve any State program for administing the noncompliance penalty provisions of Section 120 of the Clean Air Act upon finding that the program conforms to the requirements of the Act and substantially conforms to the requirements of 40 CFR Part 66, governing federally assessed noncompliance penalties.

(b) The Administrator shall not approve any State program that does not provide explicity for:

(1) A level of staffing and funding satisfactory, in the judgment of the Administrator, to carry out the requirements of Section 120 in that State, together with assurances that an adequate level of funding and staffing will be maintained in the future;

(2) A capability either through State personnel or through contractors, for carrying out analysis of financial data and for applying the Manual satisfactorily, in the judgment of the Administrator, to implement the requirements of Section 120 in that State, together with assurances that such capability will be maintained in the future;

(3) An administrative hearing whenever a source challenges a finding of noncompliance or denial of an exemption or the amount of a penalty under Section 120. This hearing need not conform to the full formal requirement of 5 U.S.C. 554 as long as it provides for:

(i) A decision on the record;

(ii) A decision by a person who has not performed investigative or litigating functions in that case or a related case;

(iii) Opportunity for any cross-examination necessary for full disclosure of material facts, or an equivalent opportunity for confrontation between and resolution of differing positions on material factual matters; and

(iv) An initial decision by the hearing officer within ninety days of commencement of the hearing to decide a petition for an exemption or challenge to a State penalty calculation.

(4) Explicit provision that:

(i) The record of each hearing held under subparagraph (3) shall be transmitted to the Administrator within thirty days of the final State decision in the matter;

(ii) A copy of each nótice of noncompliance and of any subsequent correspondence regarding the notice of noncompliance (other than correspondence covered by subparagraph (i) above) shall be sent to the Administrator at the time it is mailed or received by the State agency administering the Section 120 program; and

(iii) A copy of each calculation of a noncompliance penalty and of any subsequent correspondence regarding that penalty (other than correspondence covered by subparagraph (i) above) shall be sent to the Administrator at the same time it is mailed or received by the State agency administering the Section 120 program.

(c) The State may authorize a local agency to carry out a Section 120 program, or part of it, within that local agency's jurisdiction as long as the role of that local agency is clearly identified in the program submission and it meets the requirements for approval under this section.

(d) No State penalty program shall be disapproved because it is more stringent in any manner than the program established by Section 120 as long as the Administrator concludes that the State has independent authority under State law to administer the more stringent portions of the program.

§ 67.12 Application for approval of programs.

A State that wishes to administer a Section 120 program shall submit an application in writing to the Administrator describing its proposed program in detail sufficient to justify a conclusion that the requirements of § 67.11 have been met. All necessary supporting materials shall be transmitted along with the application.

§ 67.13 Approval.

(a) The Administrator after evaluating any application submitted under § 67.12 shall:

(1) Approve the State program if he determines that the requirements of § 67.11 have been met;

(2) Request additional information if he determines that the information submitted is not sufficient to allow him to determine whether the requirements of § 67.11 have been met; or

(3) Disapprove the State program if he determines that the information submitted establishes that the requirements of § 67.11 have not been met.

(b) The Administrator shall provide the applying State with written notice of any action under paragraph (a) which shall briefly state the reasons for his determination. In addition, any approval of a program under paragraph (a)(1) shall delegate to the State the authority which the Administrator has to establish and administer a noncompliance penalty program under Section 120 of the Clean Air Act. Despite any such delegation, the Administrator shall retain concurrent authority to assess and collect these penalties.

(c) Where a State is delegated the authority to implement this program, proceedings arising out of notices previously issued by the Administrator shall continue to be handled by EPA under Part 66 except to the extent the Administrator specifically delegates the handling of them to the State.

§ 67.14 Amendments to the program.

(a) Any State with a program approved under § 67.13 may at any time submit amendments to that program to the Administrator. Any such submission shall conform to the requirements of § 67.12.

(b) The Administrator shall evaluate whether the State program as proposed to be amended would conform to the requirements of § 67.11 and shall respond as provided in § 67.13.

§ 67.15 Revocation.

If the Administrator determines that a State with a program approved under § 67.13 is no longer administering the program in conformity with § 67.11 he shall provide the State written notice of that determination, setting forth his reasons. Copies of all supporting materials shall accompany the notice, or shall be placed on file in the relevant Regional Office and made available for inspection during normal business hours. The State shall have ninety days to respond in writing to this determination. If the Administrator finds after reviewing the State response that either (a) the State is in fact administering the program in conformity with Section 67.11 or (a) there are reasonable grounds to believe the State program will be brought into conformity with that section to the extent it is not aready in conformity with it, he shall withdraw his determination. If he determines that neither of these conditions has been met, he shall issue a final determination disapproving the State program and withdrawing any delegation that has been made to the State.

Subpart C—Federal Notice of Noncompliance to Sources in States With Approved Programs

§ 67.21 Federal notice of noncompliance to sources in States with approved programs.

(a) The Administrator may assess and collect noncompliance penalties against any source in a State with an approved program if he determines that the State has failed to do so.

(b) The Administrator shall inform a State with an approved program of his intent to issue a notice of noncompliance to any source(s) in that State whenever:

(1) The State has failed to issue such a notice; or

(2) The State has issued the source such a notice but has failed to diligently prosecute any subsequent step in the recovery of the penalty.

The Administrator shall inform the State that a notice of noncompliance will be issued to the source(s) in question unless the State cures the defect in its proceedings within thirty days. The Administrator shall issue the notice unless he determines that the actions taken by the State are likely to cure the defect identified as the ground for issuing the notice.

(c) Any notice issued under this section shall be issued as provided in Subpart B of Part 66 and shall be treated procedurally just like a notice issued under that section. By issuing a notice under this Section, EPA assumes exclusive jurisdiction to conduct the penalty assessment proceedings in question.

Subpart D—EPA Review of State Exemption Decisions

§ 67.31 When EPA will review.

(a) The Administrator, within 90 days of receipt of a State's notice of penalty assessment, may review any State decision to grant an exemption under the standards laid down in the Act and Subpart D of Part 66 to determine whether it conforms to those requirements.

(b) Nothing in this subpart shall preclude a State from being more stringent than these regulations would otherwise require.

§ 67.32 Procedure where no formal State hearing was held.

Whenever the Administrator decides to review a State exemption decision for which no hearing conforming to § 67.11(b)(3) was held, he shall evaluate the documents relating to that decision transmitted to him by the State as provided § 67.11(b)(4). The Regional Administrator shall then proceed in accordance with § 66.42.

§ 67.33 Procedure where a formal State hearing was held.

(a) Whenever the Administrator decides to review a State exemption decision for which a hearing conforming to § 67.11(b)(3) was held, he shall prepare an evaluation of and draft conclusions based on the State hearing record transmitted to EPA as provided in § 67.11(b)(4), as well as any other pertinent information.

(b) Upon completing the evaluation of the State hearing record, the Administrator shall send a copy to each person who participated in the State hearing, and shall issue public notice summarizing the reasoning and conclusions of the evaluation and stating that a public hearing on the State exemption decision will be held at a given time and place.

(c) Public hearings under this section shall be informal and of a legislative nature. Agency participants shall include persons who will have substantial responsibility for advising the Administrator in preparing his final decision. No new evidence may be introduced. Instead, the proceeding shall be in the nature of an appellate review of the State decision based on the State record. A verbatim transcript of the hearing shall be made.

(d) As soon as feasible after the close of the hearing under paragraph (c), but no later than sixty days after receipt of a petition under or issuance of a notice under this Section, the Administrator shall issue a final decision. The final decision shall contain a response to all significant points raised at the hearing.

Subpart E—EPA Review of State Penalty Assessments

§ 67.41 When EPA will review.

Whenever the Administrator determines that a penalty assessed by a State is less than the Technical Support Document and the Manual require, he shall object in writing to the State as provided in §§ 67.42 or 67.43. Any such objection shall be made within ninety days of receipt of either the final State decision in the matter or any item of information considered in the State proceeding which is necessary to enable the Administrator to independently evaluate the State assessment, whichever occurs last.

§ 67.42 Procedures where no formal State hearing was held.

Where the Administrator objects under § 67.41 to a State penalty assessment in a case in which no formal hearing under § 67.11(b)(3) was held, he shall issue his objection in the form of an evaluation conforming to § 66.51 of the State documents relating to that assessment transmitted as provided by § 67.11(b)(4). That objection shall be treated procedurally in the same manner as any other notice issued under § 66.51.

§ 67.43 Procedures where a formal State hearing was held.

(a) Whenever the Administrator objects under § 67.41 to a State penalty assessment in a case in which a formal hearing conforming to § 67.11(b)(3) was held, he shall issue that objection in the form of an evaluation of and draft conclusions based on the State hearing record transmitted to EPA as provided in § 67.11(b)(4), as well as any other pertinent information.

(b) The Administrator shall send a copy of this evaluation and objections to each person who participated in the State hearing, and shall issue public notice summarizing the reasoning and conclusions of the evaluation and stating that a public hearing on the State penalty calculation will be held at a given time and place.

(c) Public hearings under this section shall be informal and of a legislative nature. Agency participants shall include persons who will have substantial responsibility for advising the Administrator in preparing his final decision. No new evidence may be introduced. Instead, the proceeding shall be in the nature of an appellate review of the State decision based on the State record. A verbatim transcript of the hearing shall be made.

(d) As soon as feasible after the close of the hearing under paragraph (c) but no later than sixty days after issuance of a notice under § 67.41, the Administrator shall issue a final decision. The final decision shall contain a response to all significant points raised at the hearing.

I. INTRODUCTION AND SUMMARY

II. ECONOMIC SAVINGS AND THE NONCOMPLIANCE PENALTY

III. ASSUMPTIONS UNDERLYING THE PENALTY CALCULATIONS

IV. DEFINITIONS OF PARAMETERS AND SOURCES OF DATA

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APPENDIX A

CLEAN AIR ACT

SECTION 120

NONCOMPLIANCE PENALTIES

TECHNICAL SUPPORT DOCUMENT

Attachment

A DEFINITION OF SYMBOLS

B INVESTMENT TAX CREDIT QUALIFICATION

C DEPRECIATION

D TAX RATE ADJUSTMENTS

E FACILITIES WITH LIMITED USEFUL LIVES

F APPLICATION TO GOVERNMENT FACILITIES

G DERIVATION OF NONCOMPLIANCE PENALTY WHEN THE INFLATION RATE EQUALS THE DISCOUNT RATE

INTRODUCTION AND SUMMARY

The decision to install pollution control equipment implies a decision to commit financial resources, both initially in the form of capital investment and over time in the form of operating and maintenance expenses. While the acquisition of such equipment and its operation may result in improved environmental quality, it is unlikely to yield any direct economic benefit to the firm. If these financial resources were not required for pollution control equipment, they presumably would be invested in projects which would give a direct economic benefit to the firm. Thus, from a strictly economic point of view, it is usually in the firm's best interest to delay the commitment of funds for pollution control equipment.

Congress acted in 1977 to remove this incentive for noncompliance. The Clean Air Act ("the Act") was amended to require the imposition of penalties against firms not in compliance with pollution control regulations. These penalties must be based on the savings which accrue to a firm as a result of its noncompliance. Section 120 of the Act states:

> "The amount of the penalty which shall be assessed and collected with respect to any source under this section shall be equal to--
>
> (A) the amount determined.....which is no less than the economic value which a delay in compliance beyond July 1, 1979, may have for the owner of such source, including the quarterly equivalent of the capital costs of compliance and debt service over a normal amortization period, not to exceed ten years, operation and maintenance costs foregone as a result of noncompliance, and any additional economic value which such a delay may have for the owner or operator of such source."

The Administrator of the Environmental Protection Agency (EPA) is given responsibility for carrying out this provision. This appendix describes the economic basis and the mathematical formulation of a noncompliance penalty to be used in conforming with the requirements set forth in the Act. It is intended to serve three distinct purposes. First, it presents in broad, conceptual terms the nature of economic savings which can accrue to a firm through delayed compliance and the calculation of a penalty to remove those savings. Second, it provides a precise mathematical formulation of the noncompliance penalty and the assumptions used in deriving it. Finally, it provides a complete specification of the sources of all of the data needed to calculate the penalty for a particular incidence of noncompliance.

This appendix is not intended to serve as an instruction manual for persons calculating noncompliance penalties. A separate appendix will be issued by EPA for that purpose.

THE VALUE OF DELAY

For the purposes of noncompliance penalties, the economic value, or savings, from noncompliance is defined to have two components: (1) the returns which can be earned on the capital costs of pollution control equipment whose purchase has been delayed, and (2) the operating and maintenance costs avoided as a result of not having installed the equipment and the returns on these savings. The first component arises because owners of noncomplying sources have the opportunity to invest their funds in projects other than pollution control equipment. These other investments yield a monetary

return whereas the purchase of pollution control equipment typically yields no monetary return. Thus a delay in compliance creates the opportunity for the owner of such sources to benefit by the amount of earnings which could be expected from alternative investments.

The second component of savings from delayed compliance is based on the operating and maintenance costs which would be incurred if the pollution control equipment were installed. These include the costs of labor, raw materials, energy and any other expenditures directly associated with the operation of the pollution control equipment. Delaying compliance allows these expenditures to be avoided altogether and therefore the noncomplying firm benefits by their amounts plus the return that can be earned on these savings (all net of tax effects, as described below).

THE NONCOMPLIANCE PENALTY

The two components of economic savings can be quantified using generally accepted economic and financial principles and estimates of such factors as equipment costs, financing costs, the inflation rate, the length of the delay, and so forth. These same techniques can then be employed to convert the savings into the basis for a penalty. As part of that conversion, an adjustment is made to incorporate the effect of capital and operating expenditures made after notice of noncompliance has been given but prior to the time at which full compliance is achieved. The resulting penalty schedule appears as a series of quarterly payments which increase with inflation.

As implied above, the calculation of the penalty requires estimates of both capital and operating costs. Because these estimates are often made well in advance of the actual expenditures, they are subject to substantial error. Once compliance has been achieved the capital cost is known and a better estimate of the operating and maintenance costs may be possible. The Act calls for a recalculation of the penalty using these revised figures. A refund will then be paid or additional penalty payment assessed based on the new estimate of economic savings.

PLAN OF THIS APPENDIX

Following the introductory section, Section II contains a discussion of the legal and economic rationale for the procedures which have been adopted for calculating the penalty. Although an attempt has been made to present the discussion in such a way that it can be understood by persons not familiar with this subject, the need to keep intact the integrity of the underlying financial theory requires that the discussion remain somewhat technical.

Section III contains a summary of the assumptions used in deriving the formulae and the reasons for adopting these assumptions. Section IV defines the various parameters included in the formulae and the sources which should be used to acquire the data needed to calculate the penalty in specific cases.

Finally, Section V presents the development of the formulae needed to compute the noncompliance penalty. The attachments describe the treatment of certain cases which require adjustment of either the data or the formulae.

SECTION II

ECONOMIC SAVINGS AND THE NONCOMPLIANCE PENALTY

The costs associated with controlling pollution arise from many sources. The most apparent are the original purchase cost of the capital equipment and the annual operating and maintenance expenditures. There may also be costs associated with the financing of the original purchase; for example, interest would be paid if a portion were financed with borrowed funds.

In addition to the direct costs, other financial impacts result from the purchase of equipment. Depreciation, for example, has the effect of reducing income tax liability in years subsequent to the original investment. Similarly, the original purchase may result in an investment tax credit, acting much the same as if a discount were given on the purchase price. Both of these have the effect of lowering the net cost to the firm.[1]

To calculate the economic value to a firm from delaying compliance with pollution control regulations, it is necessary to evaluate on a consistent basis the effect of all costs avoided, and related tax consequences, between the date by which compliance is required and the date on which compliance actually occurs. Because the various savings do not all occur at the same time, they must first be converted into values which are comparable with respect to the

[1] The term "firm" will be used to designate the owner of the pollution source. The discussion is equally applicable to sources owned by individuals.

time-value of money (that is, the sooner a savings is generated, the more valuable it is). This conversion is accomplished by discounting all estimated future savings into their "present value" equivalents, a technique described below. Finally, the sum of the discounted values must be converted into series of level quarterly penalty payments as prescribed by the Act.

This section describes the process of translating the estimated costs and tax consequences associated with the purchase and operation of pollution control equipment into a penalty. That penalty reflects the savings that a firm realizes by delaying its compliance with pollution control regulations

POLLUTION CONTROL CASH FLOWS

The above discussion of the financial impact of delaying an investment in pollution control equipment was expressed in terms of costs, net of related tax consequences. A question arises as to the appropriate metric with which to measure these costs. The financial literature is clear on this subject the appropriate metric is the incremental cash flow, positive or negative, associated with each cost.[1]

[1] See, for example, Weston, J.F. and Brigham, E.F., Managerial Finance, p. 275-281, or Van Horne, R.C., Financial Management and Policy, p. 78-81.

In order to properly measure each incremental cash flow, account must be taken not only of the initial effect but also of any offsetting tax effects. For example, payments for operations and maintenance are tax deductible. Therefore, the incremental cash flows resulting from such payments consist of the initial expense less any reduction in tax liability. Stated differently, all flows are measured on an after-tax basis. For most large corporations this means that the net cash flow resulting from tax-deductible payments will usually be about one-half of the stated pre-tax cost.

There are three categories of cash flow arising from the purchase and operation of pollution control equipment. These are: (1) the initial capital outlay required to purchase and install equipment; (2) the subsequent annual flows associated with depreciation and financing of the initial capital outlay; and (3) the subsequent annual expenses of operating and maintaining the equipment. The first category is equal to the cost of purchasing or constructing the equipment, less the amount of any applicable investment tax credit. The investment tax credit constitutes a reduction in tax liability which has the effect of a discount on the purchase price. Both of these flows are repeated when the equipment is replaced at the end of its useful life and will become successively larger at each future replacement point because of inflation in equipment cost.

The second category consists of those cash flows occurring in subsequent years as a direct result of the initial capital expenditure. One of these, depreciation, does not itself involve a cash outflow; however, its effect is to reduce pre-tax income and hence to reduce tax. If the firm were to install the equipment, the tax savings associated with depreciation in subsequent years would have the effect of reducing its costs. In the context of noncompliance, the effect of expected depreciation is to decrease the savings associated with not installing the equipment. Other annual capital-related cash flows arise from the financing of the incremental capital outlay for the pollution control equipment in question. For example, if the equipment is partially financed with debt, both principal and interest (net of tax effects) payments will result. Similarly, if preferred stock is used, its redemption and its dividends will give rise to cash outflows.

Each of these cash flows will occur over the depreciable life of the equipment. As in the case of the initial acquisition costs, these capital-related flows will become larger in successive replacement cycles because inflation will have increased the capital cost on which they are based.

The final category of cash flows consists of those resulting from operating and maintenance expenditures. Since these costs are tax deductible, the relevant cash flows are simply the after-tax value of their estimated amount in each year. These cash flows are assumed to increase each year due to inflation in the cost of the expenditures (e.g., labor, materials, energy, etc.) which trigger them.

DISCOUNTING OF CASH FLOWS

Once all incremental cash flows have been estimated, they must be converted into a set of values which reflect the timing of their occurrence. This procedure is necessary because two cash flows of equal dollar value occurring many years apart do not have equal impact on the firm. This differential arises because the firm can invest funds at some positive rate of return. If a dollar of expenditure can be postponed for one year, that dollar can be invested in the interim. At the end of the year the dollar of expenditure can be made and the return on the investment during the intervening period accrues to the benefit of the firm.

The technique used to compensate for this effect is called discounting. Discounting involves reducing the value of future cash flows to amounts which are equivalent in terms of present dollars. As an example, suppose that a firm faced with a $100 expenditure could delay that expenditure by one year (assume no inflation). If the firm could invest money for that year at a 10 percent return, it would not need to put aside a full $100 to make the payment one year later. In fact, if it invested only $90.91 at a 10 percent return, that amount would grow to $100 in one year. Therefore, $90.91 is the present value, at 10 percent, of a $100 cash flow one year in the future.

Similarly, $82.64 invested at 10 percent would grow to $100 in two years (it would grow to $90.91 in one year and to $100 in the second year). $82.64 is therefore

the present value, at 10 percent, of a $100 cash flow two years hence. The present value of cash flows for other numbers of years in the future is found in a similar fashion. The formula is given by:

$$\text{Present Value} = \frac{\text{Future Value}}{(1+E)^j} \qquad (1)$$

where E = the discount rate.

j = the number of years in the future in which the cash flow occurs.

Future Value = the cash flow expected in the future.

Applying this technique to all future pollution control cash flows converts each of them into its present value equivalent[1]. The sum of these individual values represents the equivalent after-tax cost, in terms of a single present value, of all future cash flows arising out of the requirement to purchase and operate pollution control equipment.

THE VALUE OF DELAY

For each polluting facility there is a date by which compliance should be achieved. Under Section 120 of the Act, the period of covered noncompliance--i.e., the period over which a noncompliance penalty must be assessed--begins on the date on which a notice of noncompliance is issued but not before August 7, 1979. Therefore, for

[1] For a more thorough discussion of this concept see the capital budgeting chapters in the Weston and Brigham or Van Horne texts previously cited.

purposes of calculating the penalty, it will be assumed that all capital expenditures should have been made by that date and that operating and maintenance expenditures should begin on that date.

In comparing the cost of compliance with the cost of delay, there are two sets of cash flows to be considered. The first consists of the flows that the firm would have experienced had it come into compliance on time. These include the flows attributable to the purchase and operation of the original equipment as well as those associated with all future replacement cycles. The second set of flows consists of those which the firm will experience when, following the delay, it actually does come into compliance. This second set of flows will have three properties:

- It will be similar to the first set in that it will have the same sequence of capital expenditures, depreciation tax savings, operating and maintenance flows, and so forth.
- It will begin at some time after the first day of noncompliance.
- The magnitude of each of its individual component flows will be greater than the corresponding flow in the first set because any given cost will have inflated during the period of projected delay.

The present value of both sets of cash flows, as of the first day of noncompliance, can be calculated in the manner described above. The present value of the second set will be lower, reflecting the fact that delaying compliance yields a financial benefit to the firm. That benefit is equivalent to the economic savings from delay; its magnitude

is equal to the present value of the cash flows in the first set less the present value of those in the second set. This calculated value of economic savings in turn becomes the basis on which the noncompliance penalty is derived.

THE EFFECT OF PRE-COMPLIANCE EXPENDITURES

It is implicitly assumed in the above discussion that capital expenditures associated with delayed compliance were made in a single payment on the first day that the firm is projected to come into compliance and that no operating and maintenance expenditures were required prior to that time. If these expenditures instead involve a series of payments made prior to the eventual compliance date, the firm's savings from delay is reduced in relation to the amount which would have been calculated according to the preceding discussion. This effect can best be understood by reference to the following diagrams, where the effect of one or more pre-compliance capital expenditures is shown.

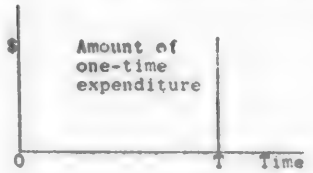

Diagram A:
Lump Sum Capital Expenditure

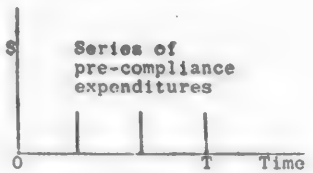

Diagram B:
Pre-compliance Capital Expenditure

Diagram A illustrates the case described earlier--compliance is delayed from O until T at which time the entire capital expenditure is made. Diagram B depicts the case where the same total expenditure has been divided into three equal payments, the third of which occurs at time T, the date on which the firm finally comes into compliance. Because the effect of discounting is least when cash flows are least distant in the future, the present value of the cash flows in diagram B is greater (because they have been discounted less) than the present value of the single cash flow in diagram A. Thus, a firm whose expenditures are similar to those depicted in diagram B will experience greater costs when it eventually complies, and hence lower savings from delay, than a firm whose expenditures are as depicted in diagram A. To account for this difference, an adjustment is made in the penalty calculation for firms which must make capital expenditures prior to achieving full compliance. A similar adjustment is made where there are pre-compliance operating costs.

CONVERSION OF SAVINGS INTO THE NONCOMPLIANCE PENALTY

The Act specifies that the total penalty assessment is to be paid in a series of equal quarterly payments. The legislative history accompanying the Act implies that the payments should be equal in real dollar terms.[1] The quarterly payments, therefore, should be structured so as to increase at the projected rate of inflation. Such a series, when deflated, will contain penalty payments which are level in real terms (that is, in constant dollars).

[1] Congressional Record/Senate, August 4, 1977, p. 13,698.

Once the present value of the savings from delay has been calculated and adjustments have been made to account for pre-compliance expenditures, the magnitude of the required quarterly payments may be determined. Since the period of noncompliance is assumed to be known,[1] all that needs to be done is to create a series of quarterly payments during this period with each payment increasing at the rate of inflation and with the present value of all payments summing to the value of delay which was just calculated. A formula for making this conversion is described in Section V.

POST COMPLIANCE SETTLEMENT

The amount of the noncompliance penalty is derived from an estimate of the future costs of purchasing and operating the required pollution control equipment. The amount of the penalty is also affected by the estimated schedule of pre-compliance capital and operating expenditures. These estimates will represent the best judgement of the firm's management or of independent engineers and, as such, will clearly be subject to error. For this reason the law requires that a procedure be established whereby the penalty can be adjusted after compliance has been achieved and less uncertainty surrounds some of the estimates.

[1] Any error in its estimation can be corrected at the time of the post-compliance settlement.

As described in the preceding discussion, the noncompliance penalty has two components, one related to capital costs and the other to operating and maintenance expense. The settlement process is similarly divided into capital and operating and maintenance components.

Once the capital equipment has been purchased and installed, the associated costs can be determined from the firm's accounting records. These, however, do not represent the costs which, had estimation been perfectly accurate, would have been used in the original penalty calculation. The cost used then was the estimated amount which should have been expended at the time the penalty was first assessed. The actual expenditure, coming at a later date, would reflect the impact of inflation. Therefore, for purposes of recomputing the penalty, the amount actually spent to comply must be adjusted downward to remove the effect of inflation.

Similarly, the actual size of operating and maintenance costs cannot be determined until after the pollution control equipment has been in operation for some time. In order for a post-compliance settlement to accurately reflect the actual level of such costs, settlement could not take place for months or even years after compliance has been achieved. However, the Act requires settlement within six months of the date on which compliance is achieved. If during this six-month period of operation it is apparent that the original estimate for operating and maintenance expense was inaccurate, an adjustment to the original savings calculation should be made by revising the operating and maintenance component.

These revised costs, both capital and operating and maintenance, and the actual schedule of pre-compliance expenditures are then substituted into the noncompliance penalty formula and a revised penalty series is calculated. The difference between the penalties actually paid and the revised amounts constitutes the basis for the post-compliance settlement. If the penalty has been overpaid, the excess will be refunded with interest. If it has been underpaid, the deficiency must be paid, also with interest. Under the Act, the rate of interest is set by the Secretary of the Treasury.

Section III

ASSUMPTIONS UNDERLYING THE PENALTY CALCULATION

The basic concept underlying calculation of the noncompliance penalty is that the economic savings resulting from delaying compliance with pollution control regulations should be removed. Implementing this concept requires making several important assumptions, many of which were only implicit in the discussion in the previous section. A list of those assumptions and an explanation of why certain of them have been made follows.

The calculation of the savings to a firm from delaying compliance is based on widely accepted principles of financial and economic theory. Moreover, the methodology is one which most firms routinely employ in making their own investment decisions. Most of the assumptions made are not unique to the analysis of pollution control investments but rather are an integral part of the methodology itself. Similarly, the parameters required and their respective data sources are, with few exceptions, those which would commonly be employed by financial analysts.

However, there are some instances in which either the assumptions made or the data sources specified are not those most commonly employed. In many of these cases, the need to eliminate ambiguity in the regulations dictated the choice among alternatives. In others, the goal of controlling the administrative costs both to the firm and to EPA was the major factor. In all such cases, care was exercised to insure that the effect on the size of the resulting penalty would be slight. In fact, in most instances where a choice among alternative assumptions or data sources had to be made, the one resulting in the lowest penalty was selected.

1. The relative mix of debt, preferred stock and common equity allocated to pollution control equipment is the same as that found in the firm's capital structure as shown on its balance sheet.

On the balance sheet of any firm, total net assets, including net working capital, are exactly equal to total long-term financing. Any increase or decrease in net assets must be accompanied by a similar change in long-term financing. Under the assumed allocation scheme, each asset is allocated a share of each source of long term financing (long-term debt, preferred stock, and equity) proportionate to its share of the total net asset structure. Thus the sum of the shares of each source of long-term financing allocated to an asset will exactly equal the net book value of that asset. As the asset is depreciated, its share of each source of long-term financing declines but, other factors being equal, the mix of debt, preferred stock, and equity associated with that asset is unchanged.

Implicit in the assumed allocation system is the related assumption that the mix of total sources of financing is constant over the life of any particular asset. The mix may fluctuate on a year-to-year basis due to short-run discontinuity.[1] The mix may also be subject to long-term,

[1] Firms are often observed issuing new stock or selling bonds, but rarely do the two occur simultaneously. Thus, the capital structure of a firm may fluctuate from year to year. However, as discussed below, an accepted principle of financial theory is that each firm has an optimal financial structure which it aims to preserve over the long run. Obtaining long-term financing, such as a new debt or equity issue, is expensive and time-consuming and, therefore, firms tend to secure large amounts at one time. Thus, the firm's capital structure may fluctuate on a year-to-year basis, even though the long-term structure remains unchanged.

secular changes due to gradual changes in the evaluation of management or financial markets as to what mix is optimal. During the intermediate period in which the useful lives of most assets fall, however, the mix of debt, preferred stock, and equity is assumed to be constant and unaffected by the addition or subtraction of any particular asset for which financial support is required. Given this assumption, it follows that an appropriate basis for allocating financial sources to particular assets is the pro rata basis used here.

An alternative approach would be to assume that the addition or subtraction of particular assets from a firm's total net asset structure will lead to a long-term change in the firm's financial structure. At the margin, therefore, it would be appropriate to assign to an asset a pattern of financing different from that of the firm as a whole. In the case of pollution control equipment, this approach can be illustrated by two extremes. At one extreme is the assumption[1] that the entire cost of the equipment is financed by equity, typically the most expensive source. The argument for this assumption is that a "normal" investment which a firm might make would hold the promise of creating future returns. It is the expectation of those future returns which enables the firm to convince investors to lend it money. However, a so-called "investment" in pollution control equipment is not really an investment; that is, it does not represent an expenditure of funds made in the expectation of generating future cash returns. Therefore, it does not add to

[1] See, for example, Pogue, Gerald A., Estimation of the Cost of Capital for Major United States Industries With Application to Pollution Control Investments, p. 5-15.

the firm's ability to carry debt. Such an "investment" would therefore be required to be funded entirely by equity shareholders. This would tend to increase the cost of the pollution control investment and hence increase the penalty for delaying that investment.

This argument has a certain amount of intuitive appeal; however, it also has a major weakness in that it assumes that the addition of pollution control equipment does not increase, pro rata, a firm's revenues and thus its debt coverage. In the long-run, pollution control, including related capital costs, is one of the costs which a firm must recover through the sale of products. Assuming that pollution control costs do not represent too great a fraction of a firm's total assets and that pollution control requirements are applied equally throughout the economy, there is no reason to believe that pollution control costs will not be eventually recovered. Thus, the addition of pollution control assets does not alter a firm's inherent debt-coverage capability.

At the other extreme is the assumption that the investment in pollution control equipment will be financed entirely by debt. Since debt is generally the least expensive form of financing, such an assumption would result in a lower cost of compliance and ultimately a lower penalty for delaying that compliance. The argument advanced for making this assumption is that a firm may issue new debt, often in the form of pollution control bonds or some other low-cost instrument, in order to raise the funds needed to purchase the pollution control equipment.

Like the previous argument, this argument also has some degree of intuitive appeal. Again, however, the objection must be raised that without some related change in the firm's earning capability, there is still a financial mix that management and outside financial sources perceive to be optimal. Thus, while pollution control equipment may create an increase in debt in the short-run (because new debt can be acquired on favorable terms), this will be offset eventually by corresponding increases in equity and/or reductions in other long-term debt. The rationale for such an adjustment is clear. Any firm will borrow the maximum amount it can because debt is a less expensive form of financing than equity. That maximum amount, in turn, depends on management's and lendors' joint perception of risk--that is, the underlying ability of the firm to support a certain proportion of debt. As stated above, the addition of pollution control equipment should not change this perception of risk, other factors being equal. Thus, a temporary increase in debt would be quickly adjusted to the perceived optimal level.

As implied by the above discussion, the assumption of a constant financial structure over the life of an asset represents the most theoretically sound approach among the various alternatives available. Given this assumption and the several related assumptions discussed above, it is appropriate to assign to any particular asset a mix of financing which is identical to the overall mix which supports the total asset base. Hence, the pro rata system utilized in this formulation follows directly. This assumption also represents a middle ground, in terms of actually computing the noncompliance penalty, with respect to the size of the resulting penalty.

2. Cash flows are discounted using the equity method.

The rate used to discount future cash flows is the firm's return on equity. This equity discounting method is one of several different approaches to evaluating capital investments which have been developed, no single one of which has won universal acceptance from financial theorists. The equity discounting method is based on an analysis of the cash flows affecting equity shareholders. All cash flows arising out of debt or preferred stock financing are netted out. The residuals, which represent payments either to or from equity shareholders, are then discounted at the rate of return on equity.

This method has several advantages. The most important is that it measures the benefit of noncompliance from the point of view of the true beneficiary. The increased cash flow resulting from the delay of pollution control expenditures does not directly benefit the bondholders of the company. They will continue to receive the same interest payments and when their bonds mature they will be paid the face value of the bonds. Similarly, preferred stockholders will receive no direct benefit from delay. Therefore, any incremental cash flow benefits mainly the common stockholders since they are the owners of the residual cash flow (total cash flow less financing payments).

An alternative to the equity discounting method is the weighted average cost of capital. This is the method most often illustrated in introductory textbooks in corporate finance.[1] The method works by discounting incremental operating cash flows. That is, it computes cash flows resulting from investment in pollution control equipment without considering how the investment is financed. The financing aspects are accounted for in the discount rate. This rate is given by computing a weighted average cost of capital with the weightings based on the overall capital structure of the firm.

As a practical matter, there is little difference between the weighted average cost of capital method and the equity discounting method, given the previously described assumption of a constant capital structure. The weighted average cost of capital approach is conceived in terms of maximizing the total value of the firm, with total value defined as both debt and equity. However, if the proportion of debt is optimal, the objective of maximizing the total value of the firm is synonymous with that of maximizing the value ascribed to equity shareholders. The equity discounting method focuses directly on the value of equity shareholders and has been selected to emphasize the fact that the benefits of noncompliance accrue to this group.

3. The noncompliance penalty is computed as a non tax-deductible expense to the firm.

In calculating the costs on which the penalty is based, the normal tax consequences of interest, depreciation, and so forth, are taken into account. If the penalty were

[1] See Weston and Brigham, op cit.

to be allowed as an expense for tax purposes, it would need to be adjusted upward such that its after-tax cost to the firm would be the amount calculated herein.

4. Cash flows take place at the end of each year.

While expenditures such as those for operating and maintaining equipment obviously are incurred throughout the course of the year, this assumption greatly simplifies the computation. Its effect is to lower the penalty very slightly from the level it would have if these expenditures were assumed to be made on a continuous basis throughout the year.

Similarly, the cash flows arising from depreciation and those associated with long-term financing, both principal repayment and interest or dividend payments, are assumed to take place at the end of each year.

5. The rate of inflation of pollution control operating and maintenance expenditures is the same as that for pollution control equipment costs.

Currently there is no identifiable index of pollution control operating and maintenance expense. The development of an index reflecting past increases in operating and maintenance expense would require substantial resources and would not result in a significant increase in the accuracy of the penalty.

Most of the Environmental Protection Agency's studies of pollution control costs have estimated operating and maintenance expenses as a constant fraction of capital costs. This

relationship, plus the desire to keep the penalty calculation as straightforward as possible, led to the use of a single inflation rate.

6. A continuous sequence of replacement cycles is required.

As the equipment reaches the end of its useful life, it is replaced at a cost which reflects the rate of inflation. This process continues for an indefinite period, implying that the underlying source of pollution is never retired. The assumption of an infinite number of replacement cycles is common in the fields of engineering economics and corporate finance.[1]

An alternative assumption would be that the equipment is needed for a fixed number of replacement cycles, perhaps one or two. However, to make this assumption would be to imply that the economic life of the underlying source of pollution somehow depends on that of the pollution control equipment. A more reasonable alternative might be an assumption that the pollution control equipment would be needed for a fixed number of years, say twenty or thirty. The difficulty with using either of these assumptions is that it would require the selection of an arbitrary horizon at some distant time in the future. It would be extremely difficult to provide a reasonable estimate of the period of need for pollution control equipment, that is, the life of the underlying source of pollution. Fortunately, however, the effect of discounting is to reduce the importance of distant cash flows. That is, the present value of cash flows occurring

[1] A technical discussion of the use of an infinite replacement cycle is available in, Fama, Eugene F. and Miller, Merton H., The Theory of Corporate Finance, Dryden Press, 1972, pages 128-134.

twenty or thirty years in the future is very small and hence the effect of these flows on the penalty is likewise very small. This, plus the increased computational convenience and the ability to avoid having to choose a fixed horizon, led to the adoption of the continuous replacement assumption.

7. The discount rate is greater than the inflation rate.

If a firm has a choice between making an investment which yields a positive return and an investment such as pollution control equipment which returns nothing, it would obviously choose to make the former. The firm realizes that it will eventually have to comply with pollution control requirements but the longer it delays, the longer it can keep its funds invested in income-producing projects.

However, when the inflation rate is greater than the discount rate, this benefit from delay no longer exists. For example, assume that the firm could invest $1000 in projects returning seven percent but that the pollution control equipment costs were increasing each year at an eight percent rate. If the firm delayed compliance one year it would have earned $70 on its investment but the pollution control equipment would cost $80 more. Under such circumstances the firm would be better off complying immediately if it planned to comply at some time.

The formulae developed in Section V cannot be used to produce a penalty figure if the inflation rate is greater than or equal to the discount rate. If the rate of inflation of pollution control equipment cost is greater than a firm's return on equity, delaying the purchase will result in a

greater present value of cost. (The inflation will increase the future value more than the discounting will reduce it.) A firm which appears to be violating this assumption is most likely doing so because its own estimate of the returns available to it on alternative investments is higher than the discount rate used in computing the penalty.[1] This issue is discussed further in Attachment G.

[1] An alternative explanation is that the firm thinks it may be able to avoid compliance forever. This possibility is not considered further.

SECTION IV

DEFINITIONS OF PARAMETERS AND SOURCES OF DATA

Calculation of the penalty requires estimates of a large number of financial parameters, many of which are peculiar to the non-complying firm. This section contains definitions of these parameters and sources from which their actual numerical values may be drawn. In some cases, a particular source of data is specified which is different than that which might result from a strict interpretation of financial theory. Such choices were based on the costs (in resources, time or possible inconsistencies) or lack of availability of alternatives and are explained below.

1. Capital investment schedule. This schedule is an estimate of monthly expenditures to be made for purchase and installation of the required pollution control equipment. It includes not only direct purchase costs, but also such expenditures as site preparation, engineering design, and so forth. It is measured in dollars as of the first day of noncompliance.

In the event that contracts have been signed for construction or purchase of the required equipment, they should be used as the basis for such costs. Other possible bases include engineering estimates, quotations from equipment manufacturers and, where no other data are available, reasonable estimates by the owner of the facility. These costs must be stated in dollars as of the beginning of the noncompliance period.

2. Operating and maintenance expense. This parameter is an estimate of the annual cost of operating and maintaining the required pollution control equipment. It must be expressed in the same terms as capital costs. That is, the amount should represent the annual operating and maintenance expense in constant dollars as of the beginning of the first year of noncompliance. There is a provision in the formulation which automatically adjusts future years' operating and maintenance expense for anticipated inflation.

Losses in production and incremental energy costs which will be incurred as a direct result of operating the pollution control equipment should be counted as an expense in this category. On the other hand, the value of any by-product recovery resulting from such operating should be deducted. To the extent that these or other factors will result in the real cost of operating and maintenance varying over time, an estimated schedule of payments must also be provided.

Sources of estimates for operating and maintenance expense include equipment manufacturers, engineering consultants and the owner of the facility. These estimates should include all recommended operating and maintenance procedures, training and planning costs, cost of warranties, record-keeping and costs of monitors.

3. Investment tax credit. This credit is a reduction in federal or state income taxes payable as a result of making qualified capital investments. It is equal to a specified percentage of the portion of the initial capital costs which qualify under IRS regulations. The investment tax credit is included in the formulation because it has the effect of reducing the cash outflow required to purchase the pollution control equipment.

The applicable percentage is given in the Internal Revenue Code as are the criteria for qualifying investments. Further details are provided in Attachment B.

4. Marginal income tax rate. This rate is the fraction of the last dollar of taxable income which must be paid by the firm to federal, state and local governments. It is the amount by which taxes would increase if taxable income were to increase. It is different than the average tax rate--total tax divided by taxable income.

The tax rates of the various levels of government are specified by statute and depend on the level of taxable income reported by the owner of the polluting facility. A formula for computing the marginal income tax rate for a firm subject to income taxation by more than one level of government is given in Attachment D.

The noncompliance penalty is based on the incremental savings (net of tax consequences) from delaying investment in pollution control equipment. The tax effects will depend on the rate applied to the incremental cash flows--the firm's marginal tax rate.

An alternative to using the marginal income tax rate would be to use the average rate. The advantage of using such a rate is that it can be calculated directly from data contained in the firm's normal financial statements. However, the use of an average rate would not result in a correct computation of the tax consequences of an incremental investment. It was therefore rejected as a data source.

5. Inflation rate. This is the annual rate at which both capital and operating and maintenance costs are expected to grow. These cost increases are the result of inflation in various factors: labor, capital goods, energy, and so forth.

For purposes of computing the noncompliance penalty, the compounded change in the Chemical Engineering Plant Cost Inflation Index for the most recent 20 quarters of data is to be used as an estimate of the future rate of increase in pollution control expenditures.[1] The Chemical Engineering Plant Cost Index is based on a weighted average of four cost components:

[1] Chemical Engineering, McGraw-Hill, Inc., April 28, 1975 and subsequent issues. For the years 1972-1977 this rate was 8.3 percent.

fabrication and equipment, engineering and supervision, construction labor and building costs. The weights are determined by a survey of the chemical industry made by Chemical Engineering magazine. The cost components are derived from the producer price indices compiled by the Bureau of Labor Statistics.

There is no widely available index of pollution control equipment costs as such. The Chemical Engineering index is based on factors which are clearly important components of such costs. The principal alternative considered was to use some broader and more universally recognized index, such as the GNP implicit price deflator. This was considered to be a much inferior choice since it is based on a broad range of factors (food costs, housing costs, and so forth) only loosely related to the cost of pollution control equipment.

A problem with using any historical index to extrapolate the future is that changing conditions may make the forecasts inaccurate. Using an inflation rate over the past several years as an estimate of the future rate may appear to be an example of such a problem. Offsetting this problem to a great extent is the fact that a similar approach is being used for the discount rate. Since the inflation and discount rates act in opposite directions with respect to pollution control cash flows (that is, the inflation rate is used to increase future values while the discount rate is used to reduce them), it is the difference between them which largely determines the size of the penalty. However, because the firm's historic return on equity is used as the discount rate (see below), the difference between the two rates should remain fairly constant. This is true because the return on equity depends on three principal factors:

the time value of money, the riskiness of the investment and the rate of inflation. Since the first two of these are relatively independent of inflation, there tends to be a parallel movement of the return on equity and the inflation rate over the long term. Thus, any error introduced by using a historic inflation rate is counteracted by using a historic return on equity as the discount rate.

6. Discount rate. This percentage rate is to be used as the basis for discounting cash flows in future years. Such discounting is necessary to convert cash flows occurring in different years into present values. The source of the discount rate is the industry average return on the net book value of common stockholder's equity. This rate is reported by the Federal Trade Commission in its Quarterly Financial Report for Manufacturing, Mining and Trade Corporations.[1] It is based on an exhaustive sample of the firms in each industry and, subject to the limitations found in all accounting data, represents an accurate estimate of the past performance of U.S. industries. To smooth out year-to-year fluctuations, the discount rate used in computing the noncompliance penalty is the average of the most recent twenty quarters. However, as was discussed in Section III, a discount rate cannot be used that is lower than the inflation rate.

In theory, the appropriate rate to include in the formulae is the rate which investors would require in order to commit additional common equity funding to the firm. Such a

[1] For public utilities, the return on equity data is found in the April issues of Citibank's Monthly Economic Letter.

rate is usually unobtainable. A possible alternative would be to employ the internal hurdle rate which firms use to evaluate capital investments. This rate would automatically provide an insight into the firm's own estimate of its opportunity cost of equity capital. This rate would generally be higher than any of the others considered and would, therefore, result in higher penalties. Because this rate is not used in all firms and because it is often very subjectively determined, it was rejected as a source of the discount rate.

An alternative discount rate is the expected future return on a share of the firm's common stock. Unfortunately, only the small percentage of firms which are publicly held and frequently traded have realistic share prices. Moreover, even if such prices exist, the expected return would have to be estimated. It is doubtful whether a satisfactory means could be found for providing these estimates.

Although these alternatives are attractive from a theoretical standpoint, their shortcomings have led to the selection of a return on equity which is based on book values. Even this basis, however, is often an unrealiable guide to actual returns for individual firms. Smaller owners, especially, can significantly alter the amount and timing of reported earnings such that a rate of return computed on their book value might be meaningless. The likelihood that substantial resources would be needed to verify the accuracy of these data and that, even so, significant problems would still exist argues strongly for the use of industry average rather than individual firm data

Given that a return on book equity is to be used, there is another important argument for using an industry average. If firm-specific data were employed, those firms with high historical returns would, all else being equal, be required to pay higher penalties. Similarly, firms whose returns have been below industry average would pay lower penalties. Since the savings to a firm from delaying compliance is related to future returns on equity, the question becomes whether the future returns of a specific firm will be better estimated by its own past performance or that of its industry. The fact that individual firm performance is influenced by a variety of factors, often peculiar to the firm and not likely to be repeated, and that future returns are more closely related to the investment opportunities available to the industry argues for the use of industry average data.

7. Interest rate. This is the rate of interest which would be paid by the firm if additional debt were to be acquired. The interest rate is found by taking the current rate of interest on bonds of a grade equal to that on the firm's bonds having the highest rating as published in Moody's Bond Record.

If a firm's debt is not rated, the interest rate is found by using the current rate of interest on grade "A" corporate industrial bonds, published in the Bond Record. The current interest rate on grade "A" corporate bonds was chosen because it is a widely available figure which estimates the rates appropriate to a large percentage of firms.. If a firm's debt is rated "Baa" or lower, the "Baa" rate of interest is used.

8. Preferred stock dividend rate. This is the rate paid by the firm to its preferred stockholders. Like return on equity and the interest rate, the dividend rate on preferred stock represents a cost of long-term financing.

If a firm has preferred stock outstanding which has a rating, the preferred stock dividend rate is given by taking the current yield on stock of that rating as reported in Moody's Bond Record. If the stock is not publicly traded or has no rating, the rate is found by using the current preferred stock yield on grade "a" issues. If the stock is rated "baa" or lower, the "baa" rate is used. For stocks rated "aa" or higher, the "aa" rate should be used.

9. Equity share. This share is the proportion of the firm's long-term financing which is provided by common shareholders. It is a fraction, the numerator of which is the sum of all common equity accounts on the firm's balance sheet including common stock, retained earnings, capital surplus and any other accounts representing common equity investments.[1] The denominator of the fraction is given by adding to the numerator the sum of the preferred stock account plus all long-term debt issued by the owner (excluding portions of such debt in the current account).

The source of the fraction of equity in the investment is the average fraction of equity in the capital structure as given in the firm's five most recent annual financial statements. The five year average is used to smooth out year-to-year fluctuations.

10. Preferred share. This share is the fraction of long-term financing provided by preferred stock. The numerator is given by the preferred stock accounts in the firm's balance sheet and the denominator by the quantity: long-term debt plus preferred stock plus common equity interest.

The source of the fraction of preferred stock in the investment is the average fraction of preferred stock in the capital structure as given in the firm's five most recent annual financial statements.

[1] Some firms carry treasury stock as an asset on their balance sheet. Such stock should properly be shown as a contra-account to common stock. In cases where it is shown as an asset, it should be used to reduce the common equity accounts for purposes of this calculation.

11. Depreciation. Computation of the noncompliance penalty involves consideration of the depreciation-related tax benefits of an investment in pollution control equipment. The firm may choose the method of depreciation to be used, subject to conformity with Internal Revenue Service guidelines. The computer program used by EPA to calculate the penalty automatically selects the depreciation method which results in the minimum penalty. This is done under the assumption that the firm would use the depreciation method which resulted in the lowest possible cost of compliance.

The depreciation life is the minimum number of years over which a particular investment in pollution control equipment may be depreciated. The source of this figure is the lower limit on the asset depreciation range for the appropriate class of assets as given in the Internal Revenue Service publication Revenue Procedure 77-10. If the lower limit is greater than ten years, the Act requires use of a ten year figure.

12. Useful life. The useful life of the pollution control equipment is the number of years it can be expected to operate before replacement.

The source of the useful life of the pollution control equipment is the asset guideline period for the appropriate class. These are provided by the Internal Revenue Service in Revenue Procedure 77-10. They represent IRS estimates of the average lives of assets within a particular industry. They were established after an exhaustive study of actual asset lives and they are continually updated as the need arises.

SECTION V

DERIVATION OF FORMULAE

Section II described the procedure used to determine the noncompliance penalty. This section follows the same general outline in deriving the formulae used to make the calculations. All symbols used in this section are defined in Attachment A. A complete description of the parameters used and their sources was given in Section IV.

POLLUTION CONTROL CASH FLOWS

To compute the savings from delaying pollution control investment requires that the cash flows be estimated for a continuous series of replacement cycles. The simplest approach to calculating the present value of all future flows is to calculate the present value of cash flows in the initial cycle of N years and use that value as a basis for all others. The derivation described below uses such an approach.

The first category is the cash flow resulting from the initial investment of equity. It is given by:

$$EI = II * Q \qquad (1)$$

where II = the capital cost of the pollution control equipment.

Q = the fraction of the firm's capital structure made up of equity

From this amount must be subtracted the effect of the investment tax credit whose cash flow is given by:

$$ITC = II * t_{ITC} \quad (2)$$

where t_{ITC} = the adjusted investment tax credit rate.

The investment tax credit rate must be adjusted if not all of the investment qualifies for the credit. This adjustment is explained in Attachment B. Further, if the investment is financed with industrial development bonds and rapid amortization is selected (see Attachment C), only one-half of the normal investment tax credit is allowed on that portion of the investment so financed.

The second category of cash flow is the capital-related flow which occurs over the depreciable life of the equipment. It is made up of depreciation and the flows associated with financing the equipment. The effect of depreciation is to reduce the firm's tax liability. The depreciation cash flow in year j is given by:

$$DEP_j = II * d_j * t_{TR} \quad (3)$$

where d_j = the fraction of the original cost depreciated in year j (see Attachment C).

t_{TR} = the firm's marginal income tax rate (see Attachment D).

The remainder of the annual capital-related cash flows consists of principal repayments and financing charges (i.e., interest and dividends) on the debt and preferred stock issued to finance the equipment purchase. The fraction of the initial investment financed by debt is given by:

$$DEBT\ SHARE = II * B \quad (4)$$

where B = the fraction of the firm's capital structure made up of debt. Debt is repaid each year in proportion to the depreciation of the asset. That is, at the end of each year the same fraction of the principal is repaid as the original book value of the investment is depreciated. Therefore, the repayment of principal in year j is given by:

$$PRIN_j = d_j * II * B \quad (5)$$

Interest is paid at the end of each year on the principal outstanding at the beginning of that year.

$$(INTEREST\ CHARGE)_j = R_{INT} * (PRINCIPAL\ OUTSTANDING)_j \quad (6)$$

where R_{INT} = the firm's interest rate.

Since interest is tax deductible, only the after-tax effects should be considered in calculating the cash flow. Therefore, the interest payment cash flow in year j becomes:

$$INT_j = R_{INT} * (PRINCIPAL\ OUTSTANDING)_j * (1-t_{TR}) \quad (7)$$

The principal outstanding is the original amount borrowed, II * B, less the amount which has been repaid prior to the beginning of the year. The amount repaid prior to the beginning of year j is:

$$(AMOUNT\ REPAID)_j = \sum_{k=0}^{j-1} II * d_k * B \quad (8)$$

where $d_o = 0$ by definition. The principal outstanding at the beginning of year j is the amount initially borrowed less the amount repaid by the end of j-1.

$$(\text{PRINCIPAL OUTSTANDING})_j = II * B - \sum_{k=0}^{j-1} II * d_k * B \quad (9)$$

Combining equations (7) and (9) yields a formula for the interest-related cash flow in year j:

$$INT_j = R_{INT} * II * B * (1-t_{TR}) * (1 - \sum_{k=0}^{j-1} d_k) \quad (10)$$

Preferred share is given by:

$$\text{PREFERRED SHARE} = II * F \quad (11)$$

where F is the fraction of preferred in the firm's capital structure.[1] Just as the additional debt is repaid, the preferred stock must be redeemed as the asset is depreciated. At the end of each year, the same fraction of the preferred stock is redeemed as the original book value of the investment is depreciated. Redemption in year j is given by:

$$PREF_j = d_j * II * F \quad (12)$$

Dividends on preferred stock are paid at the end of each year on the amount of stock outstanding at the beginning of the year.

$$DIV_j = R_{DIV} * (\text{PREFERRED OUTSTANDING})_j \quad (13)$$

where R_{DIV} = the dividend rate on preferred stock.

[1] Note that Q + B + F must be equal to 1.

These dividends are not tax-deductible. The preferred outstanding is the original amount issued, II * F, less the amount redeemed prior to the beginning of the year. The amount redeemed prior to year j is:

$$(\text{AMOUNT REDEEMED})_j = \sum_{k=0}^{j-1} II * d_k * F \quad (14)$$

where $d_o = 0$ as before. The amount of preferred outstanding at the beginning of year j is equal to the amount originally issued less the amount redeemed.

$$(\text{PREFERRED OUTSTANDING})_j = II * F - \sum_{k=0}^{j-1} II * d_k * F \quad (15)$$

The dividend paid at the end of year j is found by combining Equations (13) and (15).

$$DIV_j = R_{DIV} * II * F * (1 - \sum_{k=0}^{j-1} d_k) \quad (16)$$

The final category of cash flow is that associated with annual operating and maintenance expenditures. These expenses grow each year at the inflation rate. Like interest and dividend payments, they are assumed to be paid at the end of the year. They are tax deductible so their associated cash flows must reflect the effect of income taxes. Let M_j be the cash flow resulting from operating and maintenance expense in year j. Define M_0 as the annual operating and maintenance expense stated in current dollars. The first payment actually made will be this amount escalated by the inflation rate. The resulting cash flow is given by:

$$M_1 = M_0 * (1-t_{TR}) * (1+I)$$

$$M_2 = M_1 * (1+I) = M_0 * (1-t_{TR}) * (1+I)^2$$

$$M_j = M_{j-1} * (1+I) = M_0 * (1-t_{TR}) * (1+I)^j \quad (17)$$

DISCOUNTING CASH FLOWS

The cash flows just calculated must next be discounted to their present values. The cash flows in the first category, initial equity investment and the investment tax credit, take place immediately (i.e. in period zero). Therefore, no discounting is required to convert them to their present value. Using equations (1) and (2), that present value is given by:

$$\begin{aligned} PV_{INITIAL} &= EI - ITC \\ &= II * Q - II * t_{ITC} \\ &= II * (Q - t_{ITC}) \end{aligned} \quad (18)$$

The present value of the net cash flow in the second category, annual capital-related flows, is given in three steps. First, the total cash flow in year j is given by summing algebraically the individual contributions of the various components. The second step is to discount this sum to determine its present value. These two steps are combined in a single equation as follows:

$$PV_{\substack{ANNUAL \\ CAPITAL \\ RELATED}_j} = \frac{-DEP_j + PRIN_j + INT_j + PREF_j + DIV_j}{(1+E)^j} \quad (19)$$

where E = the discount rate.

The negative sign preceding the depreciation cash flow results from the fact that this component represents a reduction in cash outflow. The third step is to sum the individual present values for each year of the depreciation life of the equipment (n years).

$$PV_{\substack{ANNUAL \\ CAPITAL \\ RELATED}} = \sum_{j=1}^{n} PV_{\substack{ANNUAL \\ CAPITAL \\ RELATED}_j} \quad (20)$$

The final category, operating and maintenance cash flows, must be considered over the entire useful life of the equipment. The present value of the flow in year j is given by:

$$PV_{O\&M_j} = \frac{M_j}{(1+E)^j} \quad (21)$$

The present value over the N years of useful life is given by summing the present values for each year:

$$PV_{O\&M} = \sum_{j=1}^{N} PV_{O\&M_j} \quad (22)$$

The present value of all cash flows resulting from the purchase and operation of pollution control equipment throughout the N-year life of the original equipment, PV'_{PCE}, is given by summing the contributions of each of the three categories.

$$PV'_{PCE} = PV_{INITIAL} + PV_{\substack{ANNUAL \\ CAPITAL \\ RELATED}} + PV_{O\&M} \quad (23)$$

It is now necessary to expand this value to include the present value of cash flows in all future replacement cycles. This can be accomplished by recognizing that any given future cycle is identical to the original one except that its costs have increased by the inflation rate. For example, the replacement made after N years, when the original equipment wears out, gives rise to cash flows whose present value at the end of the first replacement cycle is equal to:

$$PV'_{PCE} * (1+I)^N$$

where I = the annual inflation rate.

The present value at time 0 of these flows is thus given by discounting:

$$\frac{PV'_{PCE} * (1+I)^N}{(1+E)^N}$$

where E = the discount rate.

The present value of the cash flows from the original cycle and all future replacement cycles is therefore given by summing:

$$PV_{PCE} = PV'_{PCE} + PV'_{PCE} * \frac{(1+I)^N}{(1+E)^N} + PV'_{PCE} * \frac{(1+I)^{2N}}{(1+E)^{2N}} + \ldots$$

$$= PV'_{PCE} * \left[\frac{1}{1 - \left(\frac{1+I}{1+E}\right)^N}\right], \quad E > I \qquad (24)^1$$

[1] Equation 24 is developed using the closed form for the sum of an infinite geometric series. This algebraic manipulation and the resulting formula is valid only when E>I. The case of I=E is discussed in Attachment G.

THE VALUE OF DELAY

The quantity just calculated is the present value, as of the day on which compliance should have been achieved, of pollution control cash flows which the firm would have experienced had they not delayed. If compliance is delayed, inflation will result in the firm's facing higher costs. Once it does comply the present value of those costs, as of the day on which compliance is actually achieved, is given by:

$$PV'_{DELAY} = PV_{PCE} * (1+i)^L \qquad (25)$$

where i = the monthly inflation rate[1]
L = the number of months of delay

The present value as of the day on which compliance should have been achieved is given by discounting:

$$PV_{DELAY} = \frac{PV'_{DELAY}}{(1+c)^L}$$

$$= PV_{PCE} + \left(\frac{1+i}{1+c}\right)^L \qquad (26)$$

where c = the monthly discount rate[1]

The savings from delay is thus given by the difference between these two present values:

$$SAVINGS = PV_{PCE} - PV_{DELAY}$$

$$= PV_{PCE} * \left[1 - \left(\frac{1+i}{1+c}\right)^L\right], \quad i > I \qquad (27)$$

[1] Both the inflation rate and the discount rate will normally be given in annual terms. If "A" is an annual rate, its monthly equivalent "a" is given by:

$$a = (1+A)^{\frac{1}{12}} - 1$$

CONVERSION OF SAVINGS INTO MONTHLY EQUIVALENTS

In order to convert the savings from noncompliance into a series of penalty payments, it is necessary to express savings as a series of equivalent monthly amounts.[1] This series, which will be referred to as the "savings equivalent", must have two attributes:

- It must have the same present value as the cash flows which would have resulted from investment in and operation of the required pollution control equipment. When these amounts are translated into a penalty, this requirement is intended to insure that a firm which continues to delay its pollution control expenditures will not benefit by doing so.
- The savings equivalents must escalate at the rate of inflation. If this requirement is not met, the early penalty payments overstate the savings to the firm while later payments understate it.

Let S_j be the savings equivalent at the beginning of month j. The requirement that the series escalate with inflation implies that:

$$S_2 = S_1 * (1+i)$$

$$S_3 = S_2 * (1+i) = S_1 * (1+i)^2$$

$$S_j = S_{j-1} * (1+i) = S_1 * (1+i)^{j-1} \qquad (28)$$

where i = the monthly inflation rate

[1] The final penalty payment will be made on a quarterly basis. However, in order to increase the accuracy of the penalty calculation, all adjustments to the economic savings are made on a monthly basis.

The present value of each of these terms is calculated by discounting:

$$PV_{S_j} = \frac{S_j}{(1+e)^{j-1}} \qquad (29)$$

Combining with equation (28) yields:

$$PV_{S_j} = \frac{S_1 * (1+i)^{j-1}}{(1+e)^{j-1}} \qquad (30)$$

The present value of these L monthly savings equivalents must be equal to the savings from delay. Thus,

$$\text{SAVINGS} = \sum_{j=1}^{L} PV_{S_j}$$

$$= \sum_{j=1}^{L} S_1 * \left(\frac{1+i}{1+e}\right)^{j-1}$$

or,

$$S_1 = \frac{\text{SAVINGS}}{\sum_{j=1}^{L}\left(\frac{1+i}{1+e}\right)^{j-1}}$$

$$= PV_{PCE} \quad \frac{1 - \left(\frac{1+i}{1+e}\right)^{L}}{\sum_{j=1}^{L}\left(\frac{1+i}{1+e}\right)^{j-1}}$$

$$= PV_{PCE} * \frac{e-i}{1+e} \qquad (31)$$

This represents the first term in the series. All terms after the first month can be computed by multiplying S_1 by the quantity (1+i) raised to the appropriate power. For example, the savings equivalent at the beginning of the k^{th} month would be:

$$S_k = S_1 * (1+i)^{k-1} \quad (32)$$

The present value of these monthly savings equivalents is equal to the present value of the costs avoided during the period of noncompliance.

THE EFFECT OF PRE-COMPLIANCE EXPENDITURES

The series of savings equivalents just developed is based on the assumption that a firm installing pollution control equipment will pay for it when installation is completed and operation begins. In fact, substantial intermediate payments will often be required before final installation is completed. In calling for the imposition of a noncompliance penalty, Congress explicitly required that these intermediate payments be accounted for in the penalty calculation. The adjustments needed to incorporate the effect of intermediate payments are described in the following paragraphs.

The procedure is begun by dividing the savings equivalent into its capital and its operating and maintenance components. The method used to account for intermediate capital payments is to adjust the capital component of a month's savings equivalent by multiplying it by a factor representing the proportion of the capital investment which is still to be made prior

to the beginning of that month. For example, if one-third of the total investment will have been made prior to the fifth month, the adjusted capital component of the savings for the fifth month is equal to two-thirds of the savings equivalent. Similarly, the operating and maintenance component of the savings in each month must be adjusted to a value which is net of any actual O&M expenditure made in the month. When all such adjustments have been made, the entire adjusted savings series is converted into a series of escalating quarterly penalty payments. This means that the schedule of intermediate payments and the compliance date must be known in advance.

The computational procedure starts by re-writing formula (31) using formula (23) and (24). This gives:

$$S_1 = \frac{e-i}{1+e} * PV_{PCE}$$

$$= \frac{e-i}{1+e} * (PV_{INITIAL} + PV_{ANNUAL\ CAP\ REL} + PV_{O\&M}) * \left[\frac{1}{1-\left(\frac{1+I}{1+E}\right)^N}\right]$$

$$= \frac{e-i}{1+e} * (PV_{INITIAL} + PV_{ANNUAL\ CAP\ REL}) * \left[\frac{1}{1-\left(\frac{1+I}{1+E}\right)^N}\right] +$$

$$\frac{e-i}{1+e} * PV_{O\&M} * \left[\frac{1}{1-\left(\frac{1+I}{1+E}\right)^N}\right]$$

$$= S_1^C + S_1^O \quad (33)$$

where the superscript C refers to the capital component of the savings equivalent and O refers to operating and maintenance component. Equation (32) for the two components can then be re-written as:

$$S_k^C = S_1^C * (1+i)^{k-1}$$

$$\text{and } S_k^O = S_1^O * (1+i)^{k-1} \qquad (34)$$

Let A_k^C be the month k capital component adjusted for pre-compliance expenditures. That is, A_k^C is equal to S_k^C times a factor representing the fraction of the total capital investment which remains to be made. If X_k is the fraction of the total investment which has been made prior to the beginning of month k, then:

$$A_k^C = (1-X_k) * S_k^C \qquad (35a)$$

The adjustment of the operating and maintenance component, the A_k^O, is equal to the fraction of required operating and maintenance expenditures avoided in each month times the savings component S_k^O. Thus:

$$A_k^O = (1-X_k) * S_k^O \qquad (35b)$$

where: X_k = precompliance operating and maintenance cost in month k divided by one-twelfth of annual estimated operating and maintenance expense required for compliance

The original series of capital components, the S_k^C, increased each month according to the monthly inflation rate. The new series, the A_k^C will sometimes increase and sometimes decrease, depending on whether the adjustment for pre-compliance payments made prior to the month is sufficient to overcome the effect of inflationary increases. Similarly, the operating and maintenance component will increase with inflation only until pre-compliance O&M expenditures are begun; at that time, the monthly amounts will decline. The resulting economic savings for each month will be equal to $A_k^C + A_k^O$. This amount will fluctuate up and down as described above.

CALCULATION OF QUARTERLY PENALTIES

The Act requires that the noncompliance penalty payments be made on a quarterly basis and all payments be of equal value. The legislative history indicates that this equality is to be in real terms. Consequently, the series of payments must increase with inflation. This can be done by converting the monthly values computed above into their present value equivalent and then converting that present value into a new series of escalating quarterly payments. Let L be the number of months which compliance is delayed. Then the present value is given by:

$$PV_{\substack{\text{ADJUSTED}\\\text{SERIES}}} = \sum_{k=1}^{L} \frac{A_k^C + A_k^O}{(1+e)^{k-1}} \qquad (36)$$

The series of escalating payments must have this same present value.[1] Thus, if P_j is the payment to be made at the beginning of quarter j, the following equality must exist:

$$\sum_{k=1}^{L} \frac{A_k^C + A_k^O}{(1+e)^{k-1}} = P_1 + \frac{P_2}{(1+e')} + \ldots + \frac{P_T}{(1+e')^{T-1}} \qquad (37)$$

where e' = the quarterly equivalent discount rate[2]
T = the number of quarterly payments

However, since $P_j = P_{j-1} * (1+i)$

$$\sum_{k=1}^{L} \frac{A_k^C + A_k^O}{(1+e)^{k-1}} = P_1 * \sum_{j=1}^{T} \left(\frac{1+i'}{1+e'}\right)^{j-1}$$

where i' = the quarterly equivalent inflation rate[2]
or,

[1]The number of required quarterly payments is determined from the months out of compliance using the formula:

$$T = \text{Integer } (L+2)$$

where, Integer = the closest integer less than or equal to the number in the brackets
L = number of months out of compliance

[2]The quarterly equivalent discount and inflation rate is found by taking the monthly equivalent discount and inflation rate to the third power. Thus:

$$e' = (1+e)^3 - 1$$
$$i' = (1+i)^3 - 1$$

where, e = monthly equivalent discount rate
i = monthly equivalent inflation rate

$$P_1 = \frac{\sum_{k=1}^{L} \frac{A_k^C + A_k^O}{(1+e)^{k-1}}}{\sum_{j=1}^{T} \left(\frac{1+i'}{1+e'}\right)^{j-1}} \qquad (38)$$

and $P_j = P_{j-1} * (1+i')$

$$= P_1 * (1+i')^{j-1} \qquad (39)$$

These payments have the following properties:

- They are equal in real terms.
- Their present value is equal to the present value of savings after adjustments for pre-compliance capital and operating and maintenance expenditures.
- If either the assumed schedule of expenditures for compliance, the amounts of those expenditures, or the compliance date are inaccurate, the payments must be revised. This is discussed below.

POST COMPLIANCE SETTLEMENT

The original penalty computation is based on the costs which the firm would have experienced had compliance not been delayed. If compliance is delayed, inflation will result in the actual expenditures being somewhat larger. This inflation-induced variation is already accounted for in the formulation described above. However, simple estimation error may also contribute to the difference and it is this error that the post-compliance settlement is intended to remedy.

The method involves re-computing the penalty using revised estimates of capital and operating and maintenance costs. These revised estimates are then used in conjunction with the actual schedule of pre-compliance expenditures to re-calculate the penalty payments. The settlement is based on the difference between these payments and those actually paid. The formula for these settlement payments is as follows: Let Δ_k be the difference between the penalty that was paid in each quarter and the amount which should have been paid during that quarter beginning k quarters ago. Then the settlement amount is:

$$Z_k = \Delta_k * (1+r)^{L-k+1}, \text{ if } k > 6 \qquad (42)$$

$$= \Delta_k, \text{ if } k \leq 6$$

where: Z_k = the amount to be paid (or refunded) on the date of compliance for each payment

k = the number of the month in which the original payment was made

Δ_k = the difference between the amount paid and the amount which is computed using revised figures for capital and operating costs

r = the monthly equivalent rate of interest determined by the Secretary of the Treasury[1]

L = the total number of months of noncompliance

[1]The Secretary of the Treasury will designate an annual rate of interest. This will be converted to a monthly equivalent rate using the following formula:

$$r = (1+R)^{\frac{1}{12}} - 1$$

where: R = annual interest rate specified by the Secretary of the Treasury.

As shown in equation 42, no interest is charged on the difference in penalty required compared to penalty paid for the first six months of noncompliance. The total post-compliance settlement as of the date of compliance is given by:

$$Z = \sum_{k=1}^{L} Z_k \qquad (43)$$

where: Z = the total post-compliance settlement as of the date of compliance

The total post-compliance settlement as of the day of compliance is then adjusted to reflect delay in the actual settlement payment. The final settlement amount is:

$$Z = Z * (1+r)^D \qquad (44)$$

where: Z = the actual settlement to be paid (or refunded) on the day of the settlement

Z = the total post-compliance settlement as of the date of compliance

r = the monthly equivalent rate of interest specified by the Secretary of the Treasury

D = the number of months between the date of compliance and the actual settlement

DELAYED EARLY PAYMENTS

In general, any time a penalty payment (P) is delayed by K months, the actual payment should be equal to:

$$P * (1+e)^K$$

The Act specifies that the first penalty payment is not due until six months after the notice of noncompliance has been given. This means that the first and second quarterly payments will be delayed for six and three months, respectively. However, a six month grace period exists after notice of noncompliance during which interest will not be charged on late payments. The first payment made by the firm at the beginning of the seventh month will thus equal the sum of the first three quarterly payments.

ATTACHMENT A

DEFINITION OF SYMBOLS

A_k^C	=	the monthly equivalent of the capital component of savings adjusted for pre-compliance expenditures
A_k^O	=	the monthly equivalent of the O&M component of savings adjusted for pre-compliance expenditures
B	=	the fraction of debt in the owner's capital structure (book value)
D	=	the number of months between the date of compliance and the payment of the post-compliance settlement
DEP_j	=	the net after-tax cash flow in year j resulting from depreciation of the initial investment
d_j	=	the fraction of original asset value depreciated in year j
Δ_k	=	the difference between the penalty paid in quarter k and the amount computed using revised figures for capital and O&M costs
DIV_j	=	the dividend payment in year j on the preferred stock used to finance the initial investment
E	=	the discount rate
e	=	the monthly equivalent of the discount rate E
e'	=	the quarterly equivalent of the discount rate E
EI	=	the amount of cash provided by equity investors to finance the initial investment

f	=	the fraction of the initial investment which is amortized on a straight line basis over five years
F	=	the fraction of preferred stock (at book value) in the owner's capital structure
I	=	the annual rate of inflation for pollution control expenditures
i	=	the monthly equivalent of the annual inflation rate I
i'	=	the quarterly equivalent of the annual inflation rate I
INT_j	=	the interest payment cash flow (after the effect of taxes) in year j on the debt used to finance the initial investment
II_{qual}	=	amount of initial capital investment which qualifies for the investment tax credit
II	=	the initial investment in pollution control equipment; the amount which will be capitalized on the books of the firm and amortized over the life of the equipment
ITC	=	the dollar amount of the investment tax credit
j,k	=	indices, usually indicating the year or month in which a cash flow occurs
K	=	the number of owners of the firm
L	=	the number of months the firm is expected to be out of compliance
M_o	=	annual operating and maintenance expense in current dollars
M_j	=	the net operating and maintenance cash flow in year j
N	=	the useful life of the pollution control equipment
n	=	the depreciation life of the pollution control equipment

P_j	=	the penalty payment to be made at the beginning of quarter j
PV	=	the present value of a cash flow
$PREF_j$	=	the repayment or reallocation of preferred stock in year j
$PRIN_j$	=	the repayment or reallocation of debt in year j
Q	=	the fraction of common equity (at book value) in the owner's capital structure
r	=	the monthly rate of interest to be paid on post-compliance settlement amounts
R_{DIV}	=	dividend rate on preferred stock
R_{INT}	=	the annual rate of interest on long-term debt
S_k^C	=	the monthly equivalent of the capital component of savings
S_k^O	=	the monthly equivalent of the O&M component of savings
S_k	=	the monthly equivalent of savings
T	=	the number of quarterly payments
t_{ITC}	=	the adjusted investment tax credit rate
t_{TR}	=	the marginal income tax rate (t_{FED} is the marginal federal rate and $t_{S\&L}$ is the marginal state and local rate)
W_j	=	the fraction of common stock held by stockholder j
X_k	=	the fraction of the capital investment which has been made prior to the beginning of quarter k
Y	=	the statutory investment tax credit rate

Z = the actual post-compliance settlement to be paid

Z_k = the additional amount to be paid (or refunded) for quarter K

Σ = the total post-compliance settlement at the time of compliance

ATTACHMENT B

INVESTMENT TAX CREDIT QUALIFICATION

Only certain assets qualify for the investment tax credit, a notable exception being most buildings.[1] If the installation of pollution control equipment involves expenditures which will be capitalized and amortized over the tax life of the equipment, but which do not qualify for the investment tax credit, then the calculation of the credit must be adjusted.

Let II_{qual} be the investment which qualifies for the investment tax credit and let II be the total investment. If the investment tax credit rate specified in the Internal Revenue Code is Y, the adjusted rate for use in the noncompliance penalty calculation is:

$$t_{ITC} = \frac{II_{qual}}{II} * Y$$

A further adjustment must be made if the investment is financed by the sale of tax-exempt industrial development bonds. If rapid amortization is used, only one-half of the credit can be taken on the investment. Investment projects partially financed by industrial development bonds and using rapid amortization receive an investment tax credit weighted to reflect the loss of one-half of the credit on the portion paid for by bonds. This is shown below:

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[1] The Revenue Act of 1978 allows use of the investment tax credit for rehabilitation expenditures in connection with business and productive structures in use at least twenty years since first placed in service or since the last qualifying rehabilitation.

$$t_{ITC} = \left[1 - \frac{b}{2}\right] * Y$$

Where

t_{ITC} = the adjusted investment tax credit rate

b = the percentage of the investment financed by industrial development bonds

Y = the investment tax credit rate specified in the Internal Revenue Code

Note that this formula is used only when rapid amortization is used.

Connecticut provides an investment tax credit for plants built in distressed areas. This tax credit lowers state taxes. Because state taxes are deductible from Federal taxes, only a portion of the credit benefits the firm. The total investment tax credit rate in states where the credit is based on actual investment is given by:

$$t_{ITC} = t_{ITC_{FEDERAL}} + \left[(1-t_{TR_{FEDERAL}}) * t_{ITC_{STATE}}\right]$$

where:

t_{ITC} = the adjusted investment tax credit rate

$t_{ITC_{FEDERAL}}$ = the adjusted Federal investment tax credit rate

$t_{TR_{FEDERAL}}$ = the marginal federal income tax rate

$t_{ITC_{STATE}}$ = the adjusted state investment tax credit rate

ATTACHMENT C

DEPRECIATION

The cash flow resulting from depreciation is given by:

$$DEP_j = d_j * II * t_{TR}$$

where d_j is the fraction of the original cost depreciated in year j and t_{TR} is the marginal income tax rate. The value of d_j will depend on the method of depreciation used by the owner of the facility. Formulae for the more common methods follow.

Straight line. Under this method, depreciation is the same during each year of the equipment's tax life (n).

$$d_j = \frac{1}{n}$$

Sum of years digits. Under this method, depreciation in year j is given by:

$$d_j = \frac{2 * (n-j+1)}{n * (n+1)}$$

Double declining balance. Under this method, depreciation in any year is the product of the remaining book value and twice the straight line rate. Switching to the straight line method is permitted after part of the asset has been depreciated. This switch, properly timed, increases the present value of the depreciation tax shield. The formula for double declining balance depreciation in year j is:

$$d_j = \max \begin{cases} \frac{2}{n} * \left(1 - \sum_{k=0}^{j-1} d_k\right) \\ \\ \frac{1}{n-j+1} * \left(1 - \sum_{k=0}^{j-1} d_k\right) \end{cases}$$

where "max" means that the greater of the two quantities to the right of the bracket should be chosen.

Rapid Amortization. A firm generally employs a depreciation method which minimizes the present value of its future income tax liability. This is accomplished by using the so-called accelerated depreciation methods, the most common of which are described above. Special rules governing the depreciation of pollution control equipment allow even faster write-offs than the accelerated methods, often resulting in still greater reductions in the present value of future tax liability. This approach, known as rapid amortization, was provided for in the Tax Reform Act of 1976.

The rules for rapid amortization are as follows:

- Divide the investment into two parts:
  - *i* the amount which would be depreciated during the first 15 years under straight line depreciation, and
  - *ii* the residual.

- The first part may be depreciated on a straight line basis over 5 years.
- The second part may be depreciated over the full tax life of the investment using whichever depreciation method the owner chooses.

The formula for the fraction depreciated in year j is most easily developed by considering the two parts separately. The fraction in year j for the first part is given by:

$$d_j^1 = \begin{cases} \frac{1}{5} * f, \text{ if } j \leq 5 \\ 0, \text{ if } j > 5 \end{cases}$$

where:

$$f = \min \begin{cases} \frac{15}{n} \\ 1 \end{cases}$$

The fraction of the second part depreciated in year j is given by the formula for straight line, sum of years digits, or double-declining balance, depending on the method used. This must be multiplied by (1-f), the fraction of the initial investment in the second part.

$$d_j^2 = (1-f) * (\text{standard fraction based on depreciation method})$$

The total depreciation fraction for year j under rapid amortization is then given by summing the two components:

$$d_j = d_j^1 + d_j^2$$

ATTACHMENT D

TAX RATE ADJUSTMENTS

The calculation of the savings from noncompliance requires use of the firm's marginal income tax rate. For most large corporations operating in states with no state income tax, this figure would be 46 percent.[1] However, a state income tax or a non-corporate form of organization complicates the matter. This appendix discusses the adjustments necessary to deal with these two factors.

State And Local Income Taxes

Firms in some locations are subject to income taxation by more than one level of government. If state and local income taxes are deductible on the federal return, the rate of taxation on income, t_{TR}, must be computed according to the following procedure.

Let t_{FED} be the federal marginal tax rate and $t_{S\&L}$ be the rate on state and local returns. Taxes paid to state and local governments are deductible expenses on the federal return. Hence, this after-tax rate is given by:

$$t_{S\&L} * (1-t_{FED})$$

The overall tax rate is the sum of federal and state and local effects. It is given by:

$$t_{TR} = t_{FED} + \left[t_{S\&L} * (1-t_{FED})\right]$$

[1] As of January 1979.

It is possible that certain local income taxes will be allowed as deductions when state income taxes are computed. In such cases, $t_{S\&L}$ is given by:

$$t_{S\&L} = t_S + t_L * (1-t_S)$$

where t_S = the marginal state income tax rate.
t_L = the marginal local income tax rate.

If the local income tax is not deductible from the state, the combined rate is given by:

$$t_{S\&L} = t_S + t_L$$

Multiple Ownership

The assumption in employing the tax rate, t_{TR}, and its components, t_{FED} and $t_{S\&L}$, is that these rates represent the marginal income tax rates applicable to the owning firm. If there is more than one owner, as might be the case if the firm were a partnership or a Subchapter S corporation, the rate used in the noncompliance penalty should be a weighted average of the rates appropriate to each owner.

The formula for either t_{FED} or $t_{S\&L}$ would then be given by:

$$t = W_1 t_1 + W_2 t_2 + \ldots + W_K t_K$$

$$= \sum_{k=1}^{K} W_k t_k$$

where:

t = the weighted average marginal income tax rate
W_k = the fraction owned by the k^{th} owner
t_k = the marginal income tax rate of the k^{th} owner
K = the number of owners

Attachment E

FACILITIES WITH LIMITED USEFUL LIVES

In some cases, a noncomplying source of emissions will not be brought into compliance but instead will be retired or replaced by a complying source. For example, a steel company with a noncomplying open hearth furnace may wish to retire that furnace rather than bring it into compliance, and may replace its steelmaking capability with a basic oxygen furnace. The basic oxygen furnace would have sufficient emission controls to allow it to meet the standards for new sources.

If the firm wishes to operate a noncomplying source for a limited period of time and then retire that source, the noncompliance penalty is calculated based on the capital and operating and maintenance costs which would have been incurred in bringing the source into compliance. These are the costs which are foregone in continuing to operate the noncomplying source and are the basis of the savings which accrue to the owner in so doing. Since the source is never brought into compliance, there are no precompliance expenditures. The full capital cost of compliance is assumed to be incurred in the final quarter before retirement.

When the firm plans to replace a noncomplying source with a new facility after some period of noncompliance, a similar approach is used. The basic calculation is based on the costs that would have been incurred in bringing the older source into compliance. However, an adjustment is then made for the precompliance expenditures made on the new complying facility. In other words, expenditures made on the construction of the new source are used to adjust the penalty much the same as precompliance expenditures on the older source would be used if they occurred. This procedure is explained below.

The basic equations utilized in the consideration of precompliance expenditures were detailed in Section V. These equations begin by breaking the savings equivalent into its capital and operating and maintenance components. The capital component is then adjusted for precompliance expenditures as shown in equation 35a:

$$A_k^c = (1 - X_k) * S_k^c \qquad (35a)$$

where A_k^c = adjusted capital component in month k

X_k = fraction of total investment made prior to the beginning of month k

S_k^c = unadjusted capital component in month k

In the case of a firm replacing an older noncomplying facility with a new source which meets the emission standards, the equation above would be used with X_k based on the total investment (for both productive capacity and pollution control equipment[1]) in the new facility and S_k^c based on the capital costs of bringing the old source into compliance. As such, X_k would represent the fraction of the total investment required for the new facility expended by the beginning of month k.[2]

The adjusted value of the operating and maintenance component--A_k^o--is equal in any month k to the amount which would have been spent at the old source in complying adjusted by the expenditures actually made for total operating and maintenance expenses of the equipment at the new source. The equation for adjusting operating and maintenance expenditures is written as:

$$A_k^o = (1 - X_k) * S_k^o \qquad (35b)$$

where A_k^o = adjusted operating and maintenance component in month k

X_k = operating and maintenance precompliance expenditure made in each month k at the new source divided by one-twelfth of the annual operating and maintenance expense of the new source[3]

S_k^o = unadjusted operating and maintenance component in month k

[1] Both production and pollution control expenditures are considered because in this case technology substitution itself as well as control equipment contribute to meeting the emission standards.

[2] Of course, this number will never be greater than one.

[3] The value of X_k cannot exceed one.

As described above, noncompliance penalties for facilities with limited useful lives are based on the costs which would have been incurred in bringing the facility into compliance. Because the source is retired rather than brought into compliance, no post-compliance settlement based on the capital and operating maintenance costs actually incurred is possible. However, if the noncomplying source is replaced with a new facility, the noncompliance penalty is adjusted based on planned precompliance capital and operating and maintenance expenditures. In such cases, a post-compliance settlement is possible and necessary to adjust for differences between planned vs. actual precompliance expenditures and the resulting alterations in the noncompliance penalty. Such a settlement involves three steps:

- The actual capital and operating and maintenance expenditures for each month are converted to dollars as of the date of noncompliance.
- Each monthly constant dollar expenditure's percentage of the total expenditure is calculated.
- The percentages of total capital expenditures and total operating and maintenance expenditures made in each month are used to adjust the respective penalty components computed in the initial penalty calculation.

The formulae are identical to those shown in Section V for the post-compliance settlement.

Attachment F

Application to Government Facilities

The noncompliance penalties described in this document are designed to remove the economic savings realized by a firm due to delayed compliance with pollution control requirements. Similar savings are also realized by government-owned facilities--emission sources owned or under the control of municipal, state, federal and other government and quasi-government entities. The statute contemplates that noncompliance penalties will be assessed against such facilities as well.

The calculation of penalties for government facilities is carried out using the same general logic as presented in this document with two important changes:

1. Cash flows due to tax and financing effects are no longer relevant.
2. A discount rate appropriate for use with government projects is used.

Each of these changes is described below.

Tax and Financing Effects

Because government facilities do not pay income taxes, cash flows which result from tax effects in the private sector are not included in the noncompliance formulae for government

facilities. As a result, cash flows due to tax savings from depreciation, interest expense, and so forth are not included in the formulae for government noncompliance penalties. The replacement of t_{ITC} and t_{TR} with zero in all formulae developed in Section V will accomplish this change.

Although governments often finance a portion of pollution control capital expenditures with debt as well as with tax revenues, the derivation of noncompliance penalties for government facilities assumes that the entire investment is made from tax revenues. This assumption is made because most government debt issues are related to specific projects (school buildings, sewer systems, highways, and so forth) and because the relationship of debt-issuing authorities in a single locale (school boards and municipal governments, highway commissions and state governments, and so forth) can be extremely complicated. The concept of investment dollars being drawn from a pool of funds with a fixed capital structure, while accurate in the private sector, is not realistic when applied to the government. Further, since noncompliance results from the lack of investment in pollution control equipment, it is impossible to utilize the actual financing mix which would have been used.

The assumption of financing with tax revenues can be carried through the formulae derived in Section V by setting the variables F (preferred stock share) and B (debt share) equal to zero and the variable Q (equity share, here assumed to be tax revenue share) equal to 1. These changes and those in the tax rate variables described above result in the following cash flow present values for government facilities.

$$PV_{INITIAL} = II * 1 \qquad (18)$$

$$PV_{\substack{ANNUAL\\CAPITAL\\RELATED}} = 0 \qquad (20)$$

$$PV_{O\&M} = \sum_{j=1}^{N} \frac{M_j}{(1+E)^j} \qquad (21 \text{ and } 22)$$

Thus, the present value of all cash flows resulting from the purchase and operation of pollution control equipment throughout the N-year life of the original equipment, for a government facility, is the sum of these contributions:

$$PV'_{\substack{PCE\\GOVERNMENT}} = II + \sum_{j=1}^{N} \frac{M_j}{(1+E)^j} \qquad (23a)$$

Equation 23a can be substituted for equation 23 in the subsequent formulae derivation presented in Section V.

Discount Rate

Considerable literature exists on the choice of a discount rate for use in analyzing government investment projects, yet there is little agreement concerning how such a rate should be developed. For the purpose of noncompliance penalties, the discount rate of 10 percent specified by the Office of Management and Budget for use in federal project analysis is utilized.[1] This discount rate is often used by

[1] Source: OMB Circular A 94 (Revised), March 27, 1972.

other governments as well, particularly in analysis of projects that will receive partial or full federal funding. Thus, use of this rate will insure that the calculation of noncompliance penalties for government facilities is accomplished on a basis consistent with the analysis of investment projects carried out by government decision-makers. In order to make this change in the formulae, the variable E is redefined to be the government discount rate and is set equal to 10 percent.

ATTACHMENT G

DERIVATION OF THE NONCOMPLIANCE PENALTY WHEN THE INFLATION RATE EQUALS THE DISCOUNT RATE

The derivation of the noncompliance penalty formulae presented in Section V assumes that the rate of inflation is less than the discount rate. In rare situations,[1] however, the rate of inflation may be greater than or equal to the discount rate. EPA proposes the following approach to calculating the noncompliance penalty in such cases. Comments on this or alternative approaches are invited.

Equation 27 on page V-9 defines the savings from delayed compliance as follows:

$$\text{SAVINGS} = PV_{PCE} * \left[1 - \left(\frac{1+i}{1+e}\right)^{L}\right], \quad E \neq i \qquad (27)$$

Where:
- i = monthly inflation rate
- I = annual inflation rate, $I = (1+i)^{12} - 1$
- e = monthly discount rate
- E = annual discount rate, $E = (1+e)^{12} - 1$
- L = months of delay
- PV_{PCE} = present value of all cash flows resulting from the installation and operation of pollution control equipment for an infinite series of replacement cycles

[1] If the inflation rate is greater than the average rate of return on equity for an industry, stockholders will cease investing in the less profitable firms in that industry. Some firms in the industry will then fail and the more profitable firms will remain. As a consequence the average return on equity for the industry will rise. Thus, situations where the inflation rate is truly greater than the discount rate will be rare and short-lived.

The variable PV_{PCE} is a function of PV'_{PCE} (the present value of all cash flows from one cycle of control equipment), the inflation rate, and the discount rate, as shown in equation 24 on page V-8.

$$PV_{PCE} = PV'_{PCE} * \left[\frac{1}{1 - \left(\frac{1+I}{1+E}\right)^N}\right], \quad E > I \qquad (24)$$

Substitution of equation 24 into 27 yields:

$$SAVINGS = PV'_{PCE} * \left[\frac{1 - \left(\frac{1+i}{1+e}\right)^L}{1 - \left(\frac{1+I}{1+E}\right)^N}\right], \quad E > I \qquad (27A)$$

When the inflation rate is greater than or equal to the discount rate, equation 27A has no solution. However, the limit of this equation as the inflation rate approaches the discount rate can be found using L'Hospital's Rule.[1] Application of this rule results in:

$$SAVINGS_{E=I} = \frac{PV'_{PCE}}{N} * \frac{L}{12} \qquad (27B)$$

[1] For an explanation of this rule, see any calculus text; for example, Calculus by G.E.F. Sherwood and A.E. Taylor, Prentice-Hall, 1957, pp. 177-181.

By reference to equation 23 on page V-7, the savings derived above can be expressed in terms of capital and operating and maintenance components as shown below:

$$SAVINGS_{E=I} = \frac{\left(PV_{INITIAL} + PV_{\substack{ANNUAL\\CAPITAL\\RELATED}} + PV_{O\&M}\right)}{N} * \frac{L}{12} \qquad (27C)$$

$$SAVINGS_{\substack{E=I\\CAPITAL}} = \frac{\left(PV_{INITIAL} + PV_{\substack{ANNUAL\\CAPITAL\\RELATED}}\right)}{N} * \frac{L}{12} \qquad (27D)$$

$$SAVINGS_{\substack{E=I\\O\&M}} = \frac{PV_{O\&M}}{N} * \frac{L}{12} \qquad (27E)$$

and by reference to equations 17, 21 and 22 on pages V-6 and V-7, the operating and maintenance component can be expressed as:

$$SAVINGS_{\substack{E=I\\O\&M}} = \frac{\sum_{j=1}^{N} \frac{M_o * (1+I)^j}{(I+E)^j}}{N} * \frac{L}{12} \qquad (27F)$$

which, for I=E, reduces to:

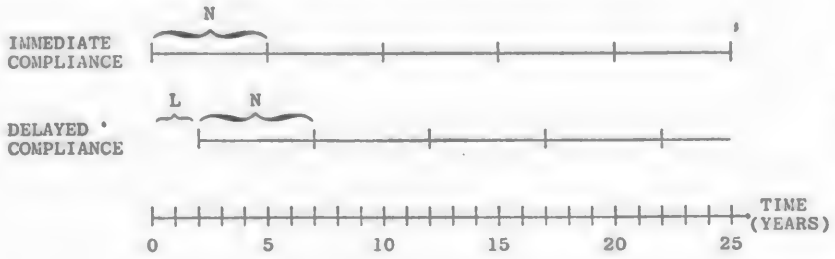
$$SAVINGS_{\substack{E=I\\O\&M}} = M_o * \frac{L}{12} \qquad (27G)$$

The results shown above can be interpreted as meaning that the savings from delay, in the case where the inflation rate is equal to the discount rate, consist of the annual share of the present value of the capital costs[1] and the yearly

[1] That is, $\left(PV_{\substack{INITIAL\\ANNUAL\\CAPITAL\\RELATED}}\right) \Big/ N$

operating and maintenance expense (M_O) both multiplied by the period of delay in years ($\frac{L}{12}$). In short, savings in this case equal some share of the capital costs of the control equipment plus the operating and maintenance expenses foregone through delay. Although both of these results are mathematically correct, the savings from the capital cost portion of PV'_{PCE} are based on an implicit assumption about the economic value of installed pollution control equipment with remaining useful life. This assumption requires further consideration.

In carrying out discounted cash flow analysis, it is necessary to analyze cash streams with equal lives in order to develop meaningful comparisons. Further, the analyst normally selects a time horizon which results in the full completion of replacement cycles for each alternative so that an economic value does not have to be specified for alternatives which have useful life remaining at the time horizon. However, because of the nature of the noncompliance penalty problem, it is impossible to choose a time horizon which will allow completion of all replacement cycles for both the immediate and delayed compliance alternatives. This is illustrated below.



Where: N = useful life = 5 years
L = delay = 24 months

At any point in the future, the immediate and delayed compliance alternatives will be at different points in their respective replacement cycles and thus will have different amounts of useful life remaining from the capital expenditures made. Thus, the analyst must make an explicit assumption about the economic value that can be realized from equipment which still has some useful life remaining at the end of the time horizon.

In the usual case where the inflation rate is less than the discount rate, the effect of discounting is to reduce the value of cash flows occurring far in the future. This fact and the use of an infinite number of replacement cycles[1] minimize the impact of the assumption concerning the economic value of the equipment with useful life remaining at the time horizon. However, when the inflation rate is equal to the discount rate, no effective discounting occurs and thus cash flows far in the future have an important impact on the present value. In this case, the assumption concerning economic value of the inplace equipment at different points in its useful life is very important.

Exhibit G-1 provides a simple numerical example of the economics of delay when the inflation rate equals the discount rate. As shown, control equipment installation is delayed one year. resulting in useful life remaining at the time horizon of four years. In this exhibit, no economic value is assigned to the remaining useful life nor is the value of the final year's depreciation tax shield ($6.83) received in the delayed alternative. Thus, the savings from delay are negative and equal the value of the tax shield lost.

[1] This assumption, which is standard practice in engineering economics and capital budgeting, relieves the analyst of the need to define a specific planning horizon and is reasonable when discounting removes the value of cash flows far in the future.

As an alternative, the analyst might assume that the remaining useful life is valued at the present value of the remaining depreciation tax shield. In other words, the single remaining year of useful life could be valued at $6.83. Such an assumption is roughly analogous to the firm writing off the book value remaining in the equipment at the time of early retirement and thus receiving all of the depreciation tax shield.[1] With this assumption, the capital savings from delay would be zero.

As a third alternative, the analyst might assume that the remaining useful life should be valued at its replacement cost at the time horizon. Exhibit G-2 shows an example using this assumption. In this case, the savings from delay are positive and equal $13.17.

The examples described above indicate that the capital savings due to delay, in the case where the inflation rate is equal to the discount rate, depend on the assumption made concerning the economic value of remaining useful life at the time horizon. The table below summarizes the results of these examples.

[1] In this example, if the firm were to write off the remaining book value of the equipment after three years of useful life, it would receive a depreciation tax shield of $20.00 or $15.02 on a present value basis. Thus, the present value of the final portion of depreciation would be $7.51 rather than $6.83 due to its occurrence one year earlier. The difference in present value of $.68 (7.51-6.83) would become the savings from delay of the capital expenditure. However, with the use of accelerated depreciation methods and longer equipment lifetimes the importance of the early depreciation would be negligible.

TABLE 1

RESULTS OF ASSUMPTIONS CONCERNING ECONOMIC VALUE OF USEFUL LIFE REMAINING AT TIME HORIZON

Assumption	Result
1. No value to remaining life.	1. Savings from delay negative and equal value of depreciation tax shield foregone.
2. Remaining life valued at worth of remaining depreciation tax shield.	2. Savings essentially zero.
3. Remaining life valued at replacement cost.	3. Positive savings.

Although the examples presented above have been relatively simple, more complex financing arrangements and longer time horizons do not alter the basic conclusions. Thus, the issue of capital savings when the inflation rate equals the discount rate becomes an issue of what is a reasonable assumption concerning the value of pollution control equipment with some portion of its useful life remaining.[1]

Most pollution control equipment is unlikely to have a positive salvage value due to the unique nature of many retrofit installations, the cost of removing reusable equipment and bringing it into operation at a new site, and so forth. Thus, it is most reasonable to assume that the firm,

[1] The mathematical formulae derived earlier predict that the capital savings from each year of delay should equal the present value of all capital-related flows divided by the useful life of the equipment. As shown in Exhibit G-1, the present value of capital-related flows is $48.31 and when divided by the useful life of four years, calculated capital savings for a one-year delay are equal to $12.08. This figure is close to the value calculated in Exhibit G-2 based on valuation of remaining life at replacement cost.

when faced with remaining useful life in equipment at the time horizon, would simply write the book value down to zero and thus capture the remaining depreciation tax shield. Although the timing of this action will determine its precise present value, the overall effect usually will be to eliminate for all practical purposes the capital savings due to delay.

In view of these factors, EPA proposes to calculate no capital savings in cases where the inflation rate is greater than or equal to the discount rate. Thus, total savings in such cases will equal the operating and maintenance component only, or

$$SAVINGS_{E=I} = M_o * \frac{L}{12} \qquad (27H)$$

This result can be used in the formulae developed in Section V in order to complete the calculation of noncompliance penalties.

Exhibit G-1

SAVINGS FROM DELAY ASSUMING NO VALUE FOR LIFE REMAINING AT TIME HORIZON

ASSUMPTIONS

1. Investment = $80 (II)
2. Useful life = 4 years (N)
3. Depreciation life = 4 years (n)
4. Inflation Rate = 10% (I)
5. Discount Rate = 10% (E)
6. Delay = 12 months (L)
7. Straight line depreciation
8. All equity financing
9. Time horizon = 4 years
10. Income Tax Rate = 50%

YEAR	0	1	2	3	4	5	6
Immediate Compliance							
Investment	(80)	-	-	-	-		
Depreciation Tax Shield	-	10	10	10	10		
Total Cash Flow	(80)	10	10	10	10		
Present Value at Time 0	(80)	9.09	8.26	7.51	6.83		
Total Present Value	(48.31)						
Delayed Compliance							
Investment		(88)	-	-	-		
Depreciation Tax Shield		-	11	11	11	11	
Total Cash Flow		(88)	11	11	11	11	
Present Value at Time 0		(80)	9.09	8.26	7.51	6.83	
Total Present Value	(55.14)						

Saving From Delay: 48.31 - 55.14 = (6.83)

Exhibit C-2

SAVINGS FROM DELAY ASSUMING REPLACEMENT VALUE FOR LIFE REMAINING AT TIME HORIZON

Assume one year of remaining life is valued at cost of replacement in year 4.[1]

- Cost of replacement: $\$80 * (1.10)^4 = 117.3$
- One year's share of replacement cost: $\frac{\$117.13}{4} = \$29.28$
- Thus, delayed alternative receives a cash inflow in year 4 of $29.28 as shown below

YEAR:	0	1	2	3	4	5	6
Delayed Compliance							
Investment		(88)	-	-	-		
Depreciation Tax Shield		-	11	11	11		
Value of Remaining Life		-	-	-	29.28		
Total Cash Flow		(88)	11	11	40.28		
Present Value at Time 0		(80)	9.09	8.26	27.51		
Total Present Value	(35.14)						

Savings from Delay: $48.31^2 - 35.14 = 13.17$

[1] All remaining assumptions are as stated in Exhibit C-1.

[2] Present value of immediate compliance from Exhibit C-1.

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CLEAN AIR ACT

SECTION 120

NONCOMPLIANCE PENALTIES

INSTRUCTION MANUAL

SECTION I

INTRODUCTION

This appendix describes the procedures used to calculate the noncompliance penalty imposed by the 1977 ammendments to the Clean Air Act (the Act). The penalty, stipulated under Section 120 of the Act, removes the economic benefits which accrue to a firm from delaying investment in pollution control.

The method used to calculate the noncompliance penalty is based on the concept of costs avoided. The costs avoided by delaying the installation of pollution control equipment have two components. First, the firm benefits by delaying the capital expenditure needed for pollution control equipment. For this component, the cost avoided equals the return the firm expects on the money that should have been invested in pollution control equipment. That is, funds which should have been invested in pollution control equipment, but were not, can be invested in other assets, thus yielding a return. The second cost avoided through noncompliance results from the absence of

operating and maintenance expenses for the equipment. In this case, the costs avoided equal the value of all operating and maintenance expense avoided plus the earnings on such costs avoided.

IMPLEMENTING THE NONCOMPLIANCE PENALTY

A detailed discussion of the economic rationale for the noncompliance penalty and the computational method used is contained in Appendix A, the Technical Support Document. This appendix is designed to aid the user in determining the appropriate data for calculating the penalty and to describe the computer program which performs the actual computation.

To the extent practicable, the computer program has been written to accept data as it appears in the source. However, it is necessary in some instances to adjust the data for entry. When this adjustment requires several computations, a worksheet has been provided.

Level Of Knowledge Required

The appendix has been written on the assumption that the user has had little formal training in business finance. Use of this manual and the computer program do not require a knowledge of the mathematical formulae in the Technical Support Document. It is assumed, however, that the reader is familiar with the discussion sections in the Technical Support Document.

Plan Of The Document

Section II describes the sources of data needed to calculate the penalty and how the various data items are converted to a form suitable for entry into the computer program. As an aid in exposition, a hypothetical noncomplying firm is described and relevant penalty calculations are illustrated.

Section III describes the procedures necessary to operate the computer. An example of an actual use of the program to calculate a penalty is included. This example will utilize data calculated in Section II.

Section IV describes the calculation of the post compliance settlement based on data used in Sections II and III.

Section V discusses the calculation of the penalty under special conditions. These conditions include investments financed with industrial development bonds and penalties for limited life facilities.

DATA REQUIREMENTS AND DATA SOURCES

Calculation of the noncompliance penalty requires a substantial amount of financial data. It is expected that most of this data, as well as the calculation itself, will be provided by the firm. This is in accordance with Section 120 of the Clean Air Act which will:

> "...require each person to whom is given under paragraph (3) to--
>
> (A) calculate the amount of the penalty owed (determined in accordance with subsection (d)(2)) and the schedule of payments (determined in accordance with subsection (d)(3) for each such source and, within forty-five days after the issuance of such notice or after the denial of a petition under subparagraph (B), to submit that calculation and proposed schedule, together with the information necessary for an independent verification thereof, to the State and to the Administrator".

However, some firms may not comply with the requirement. Section 120 further stipulates that if the firm fails to submit a calculation of the penalty, the State or the Administrator may contract with a third party to determine the penalty payments. This will require collection of data from several public sources. This section discusses the method used to collect data and prepare it for the calculation of the penalty.

Case Study

As an aid to understanding the issues discussed in this and the next section, an example has been formulated involving a hypothetical fertilizer company. While this case will utilize data from an actual corporation, the firm is not in the fertilizer industry. The example was created to illustrate many of the features of the computer program and thus may be more complex than many "real life" situations. Data prepared in the case discussion below will be entered in the computer program to determine a penalty in Section III.

THE FERTILIZER COMPANY

On September 1, 1979 the Fertilizer Company was issued a notice of noncompliance with Section 120 of the Clean Air Act. The source of emissions was an incinerator used for the disposal of a waste by-product from the manufacture of the firm's most profitable product.

A preliminary engineering study had been performed in which it had been determined that compliance could be reached with an investment of $500,000. The investment would involve the purchase of a baghouse and modifications to the firm's incinerator in order to reduce particulate emissions.

In addition to the capital investment, it was estimated that $15,000 in operating and maintenance expense would be needed each year the pollution control equipment was operated. It was also estimated that $1,890 in precompliance maintenance expense was necessary to make the equipment operational.

Engineers for the Fertilizer Company believed that it would be at least eleven months before the equipment was installed and shake-down was completed. Because the waste could be safely stored for short periods, production of fertilizer would not be interrupted while the incinerator was being modified.

The Fertilizer Company is a publicly-owned corporation with assets of $770 million. The company is mainly financed with investment by the common stockholders but some preferred stock and long term debt also exists.

The firm, in accordance with the Act, had computed the penalty owed and a schedule of payments. It had also submitted the data used in calculating the penalty. The enforcement official now had to arrange the data in the order it would be requested by the computer and verify that it was from an appropriate source. The computer program would check the accuracy of the firm's penalty calculation.

Preparing Data For Entry Into The Program

The computer program will request data in a specific sequence. Although the data submitted by the firm can be verified in any order, it is useful to verify the data in the same way so that omissions are avoided. The following paragraphs follow the same sequence as is used to enter data into the computer program.

1. The number of months the source will be out of compliance. The period of noncompliance is measured from the day on which the notice of noncompliance is issued until the time standards are actually met.[1] This will include installation time and shakedown period for the equipment. If the firm indicates that compliance will be achieved in the first fifteen days of a month, it is assumed to be in compliance for the entire month. In the Fertilizer Company example, the firm stated that it will come into compliance in eleven months.

2. Limited Life Facility. The program calculates a penalty based on eventual compliance at the source. However, some firms will attain compliance by shutting down the source or by replacing it with a new source. This option is discussed in detail in Section V. For the Fertilizer Company, the source is not a limited life facility.

[1] This date cannot be before August 7, 1979.

3. Industrial Development Bonds. The calculation of the percentage of a pollution control investment financed by tax-exempt industrial development bonds is discussed in Section V. For the Fertilizer Company, none of the investment is financed by issuing tax-exempt bonds.

4. Schedule of capital investments. This is an estimate, provided by the firm, of monthly capital expenditures for the purchase and installation of the pollution control equipment. It is assumed that all capital expenditures are completed when compliance is achieved.

The sources which firms will use to estimate monthly expenditures include engineering estimates, quotations from manufacturers, or estimates by management. They will consist of not only the direct purchase cost, including sales taxes, but also site preparation, engineering design work, shipping costs and installation expense. All costs must be stated in terms of dollars as of the beginning of the noncompliance period. Thus, a firm which will comply eleven months late should not inflate the cost estimates to reflect price changes during the period of noncompliance. The computer program automatically takes this into account.

The Fertilizer Company estimated that the total expenditure needed was $500,000. It submitted the data in Exhibit II-1 to justify the estimate. Expenditures to the manufacturer for the equipment will be made in three equal installments, during the second, fourth, and eleventh months of noncompliance. Each payment will thus be $166,666.67 ($500,000 ÷ 3).

5. Schedule of pre-compliance operating and maintenance expenditures and post-compliance annual operating and maintenance expense. These are costs the firm will incur for operation of the equipment. They may include operating and supervisory labor, power for equipment operation, supplies necessary for operation and a portion of the firm's overhead. If a by-product is created during equipment operation, disposal costs are included as an operating expense. If the by-product can be sold or used in another process, the value of the by-product should be subtracted from operating and maintenance expense.

In addition, operating and maintenance should include the incremental cost of changing plant operations to conform to the Act. For example, a firm forced to shift from high sulfur coal to low sulfur coal would include the increase in fuel costs as an operating expense. Operating expenses would also include the additional cost incurred if compliance requires shifting production to a less efficient or more expensive method.

EXHIBIT II-1

CALCULATION OF THE CAPITAL EXPENDITURE INPUT
FERTILIZER COMPANY[1]

1.	List price or estimated price of the equipment:	$485,908.65
2.	Less: Discount from manufacturer:	9,718.17
3.	Equals net price of equipment:	476,190.48
4.	Plus: Sales tax on equipment[2]:	23,809.52
5.	Plus: Freight and delivery charge:	0
6.	Equals estimated cost of equipment delivered:	$500,000.00
7.	Plus: Installation charge:	0
8.	Plus: Value of lost production:	0
9.	Plus: Cost of building modifications:	0
10.	EQUALS TOTAL CAPITAL EXPENDITURE:	$500,000.00

[1]This calculation uses Worksheet A in Attachment V.

[2]Some corporations subtract sales tax from revenue in the year of purchase. If this is the case, the sales tax is multiplied by (1 - Tax Rate) and subtracted from the cost of the equipment rather than added as in step four.

EXHIBIT II-1
(CONTINUED)

Note: Line 6 divided by line 10 is the percentage of qualified investment for calculation of the investment tax credit.

QUALIFIED PERCENTAGE INVESTMENT TAX CREDIT:

$$\frac{\text{Line 6}}{\text{Line 10}} = \frac{\$500,000}{\$500,000} \times 10^{*} = 10\%$$

*If the depreciable life of the equipment is less than seven years, this figure must be adjusted as described on page II-16.

Sources for operating and maintenance expense are engineering reports, manufacturer specifications, estimates by owners of actual data from similar operations. Two different estimates of operating and maintenance expense are necessary--those incurred before compliance and those estimated for the period after compliance. These amounts should be stated in dollar terms as of the beginning of the noncompliance period. Dollar estimates should not be increased by an estimate of inflation.

The Fertilizer Company supplied the data in Exhibit II-2 as estimated pre-compliance operating and maintenance expense.

EXHIBIT II-2

ESTIMATE OF MONTHLY PRE-COMPLIANCE OPERATING AND MAINTENANCE EXPENSE
FERTILIZER CORPORATION

PRE-COMPLIANCE OPERATING EXPENSE

Months 1-8		$ 0
Month 9		
Labor (10 hrs @ $10)	$100.00	$ 100.00
Month 10		
Labor (100 hrs @ $10)	1,000.00	
Power (1500 Kwh @ .0333 Kwh)	50.00	
Total		$1,050.00
Month 11		
Labor (50 hrs @ $10)	500.00	
Power (7200 Kwh @ .0333 Kwh)	240.00	
Total		$ 740.00

Pre-compliance monthly operating and maintenance expense cannot be larger than one-twelfth of the initial annual expense. For example, if the estimated initial annual expense is $15,000, no individual quarterly pre-compliance expenditure can be greater than $1,250 ($15,000 ÷ 12). If the pre-compliance operating and maintenance expense in a month is larger than the monthly equivalent of the initial annual expense, the computer program for calculating the penalty will not accept the data and will print an error message.[1]

For post-compliance operating and maintenance expense the Fertilizer Company supplied the data in Exhibit II-3.

[1] Monthly pre-compliance expenditures are used to adjust a penalty based on an estimate of the annual operating and maintenance expense throughout the life of the project. The requirement that pre-compliance expenditures be no more than one-twelfth of annual expense reflects the assumption that pre-compliance expenditures are similar to the annual expenditures avoided by noncompliance and do not include start-up costs and installation charges. These additional costs for installation and start-up should be included as a capital expenditure.

EXHIBIT II-3

POST-COMPLIANCE ANNUAL OPERATING AND MAINTENANCE EXPENSE

FERTILIZER COMPANY

1.	**Annual Labor Expense** 840 Hours x $10 per hour =	$8,400.00
2.	**Power Cost** 90090 Kwh x $.0333 per Kwh =	3,000.00
3.	**Water Cost** Gallons x $ per gallon =	0
4.	**Raw Materials and Supplies** 1000 Lbs x $1 per Lb =	1,000.00
5.	**Yearly Increase in Property Tax** =	3,000.00
6.	**Cost of Production Lost Due to Maintenance or Use of Equipment** =	0
7.	**Total Cost** (1 + 2 + 3 + 4 + 5 + 6) =	$15,400.00
8.	**Less: Value of By-Products** 800 Lbs at $.50 per Lb =	400.00
9.	**Annual Operating and Maintenance** (7 - 8) =	$15,000.00

[1] This calculation uses Worksheet B in Attachment V.

EXHIBIT II-3
(CONTINUED)

Note: One-twelfth of line 9 is the maximum amount of any monthly pre-compliance expenditure.

$\frac{\text{Line 9}}{12}$ = $1,250 Maximum amount which may be entered as a pre-compliance monthly operating and maintenance expense.

6. Investment tax credit rate.[1] The investment tax credit is a percentage of the investment which can be used to directly reduce federal income tax. Although the federal tax credit for an investment is currently ten percent, this rate may have to be adjusted to reflect two restrictions in the revenue code:[2]

- Investments of less than seven years do not receive the entire ten percent.
- Certain investments do not qualify for the credit.

An investment with a depreciable life of less than seven years does not qualify for the maximum investment tax credit. Currently, percentages allowed for such investments are as follows:

[1] Information on the investment tax credit is contained in the Internal Revenue Service Code, Chapter 1, Subpart B--Rules for Computing Credit for Investment in Certain Depreciable Property.

[2] In addition to the two listed restrictions, investments financed with industrial development bonds qualify for only a portion of the credit when rapid amortization is used. This adjustment is made automatically by the computer program. Further, for the purposes of noncompliance penalties the entire investment tax credit as calculated is used regardless of taxable income amount.

Depreciable Life (years)	Investment Tax Credit (percent)
Less than 3	0
At least 3 but less than 5	3.33
At least 5 but less than 7	6.67
7 or more	10.00

Items such as buildings and land are not usually allowable for purposes of computing the investment tax credit, so the percentage rate must be adjusted to yield a correct tax credit figure.[1] This adjustment is made by calculating the percentage of the investment qualifying for the tax credit and multiplying it by the percentage tax credit for equipment of similar depreciable life.

The state of Connecticut allows an investment tax credit to be applied against state taxes if the investment occurs in certain depressed areas. Because this credit reduces a tax deductible expense for federal income taxes, the credit must be adjusted to an after-tax basis. The adjustment is made by multiplying the state investment tax

[1]The Revenue Act of 1978 allows an investment tax credit for rehabilitation expenditures in connection with business and productive structures in use at least twenty years since first placed in service or since the last qualifying rehabilitation. Thus, the adjustment described above should be ignored for qualified rehabilitation investments.

credit by one minus the marginal federal tax rate. The adjusted state credit is then added to the federal credit.[1]

For the Fertilizer Company, the entire investment qualifies for the investment tax credit. If $150,000 of the investment had not been qualified, only a seven percent credit would be allowed.[2]

If the Fertilizer Company had a depreciation tax life of five years and the entire investment qualified for the investment, only a 6.67 percent credit would be allowed.

7. Income tax rate. The income tax rate to be entered into the program must be the marginal rate--that is, the rate which the firm would pay on an additional dollar of income. The firm must estimate its marginal federal income tax rate and, where applicable, its marginal state and local income tax rates. The state and local tax rates should not include sales tax, inventory tax, charter tax

[1]The formula for determining the investment tax credit in a state having a tax credit is:

$$t_{ITC} = ITC_{FEDERAL} + \left[(1\text{-Tax Rate}_{FEDERAL}) * ITC_{STATE}\right]$$

This must be multiplied by one hundred for entry into the computer.

[2]Computed as $\frac{(\$500,000 - 150,000)}{500,000} \times 10\% = 7\%$.

or taxes on property. If any of these taxes are material to the analysis, they should be included in either the investment or operating and maintenance expenditures, as appropriate. Sales tax has already been shown to increase investment while property taxes would be included in operating and maintenance expense.

In most cases involving large firms, the marginal tax rate will be 46 percent.[1] Small corporations and some partnerships or privately owned firms could have lower rates. In many penalty calculations it will be necessary to adjust the state and local tax rates to reflect the fact that the state and local income taxes are also deductible from federal taxes. The steps for calculation are as follows.

[1] As of January 1979. This rate must be adjusted for future changes in the tax laws. The rate applicable to a firm is determined by the amount of taxable income expected in the next year. The ranges of taxable income and the corresponding marginal tax rate are shown below.

Taxable Income	Marginal Tax Rate
$0 - $25,000	17%
$25,000 - $50,000	20%
$50,000 - $75,000	30%
$75,000 - $100,000	40%
$100,000 and above	46%

- The marginal federal, state and local income tax rates are determined.
- The adjusted local tax rate given state taxes is computed[1].
- The local and state tax are adjusted for the federal tax.
- The effective tax rate is computed.

Exhibit II-4 contains a calculation of the tax rate for the Fertilizer Company.

[1] If the local tax is not deductible from the state tax, the numbers should be added.

EXHIBIT II-4

CALCULATION OF TAX RATE[1]
FERTILIZER CORPORATION

1. Marginal Federal tax rate.	46%
2. Marginal State tax rate.	5%
3. Marginal Local tax rate.	2%

CALCULATION OF ADJUSTED LOCAL TAX

(1 - State Tax Rate) x Local Tax Rate
= (1 - .05) x .02
= .95 x .02
= .019 = Adjusted Local Tax Rate.

CALCULATION OF ADJUSTED STATE AND LOCAL TAX

(1 - Federal Tax Rate) x (State Tax Rate + Adjusted Local Rate)
= (1 - .46) x (.05 + .019)
= .54 x .069
= .0373 = Adjusted Local and State Tax.

CALCULATION OF TAX RATE

100 x (Federal Tax Rate + Adjusted Local and State Tax)
= 100 x (.46 + .0373)
= 100 x .4973
= 49.73 = Tax Rate.

[1]This calculation uses Work Sheet C in Attachment V.

8. Inflation rate. This is the estimated future increase in the capital and operating cost of pollution control equipment.[1] The inflation rate to be used in the Fertilizer Company penalty calculation is 8.3 percent. This was the compound rate of increase in the Chemical Engineering Plant Cost Inflation Index for the years 1972-1977.[2]

9. Discount rate. The discount rate is an estimate of the firm's cost of new equity capital. For a manufacturing firm, calculation of the discount rate requires averaging the twenty most recent quarters of the after-tax return on equity as reported for the firm's industry in Table 4 of the Federal Trade Commission's Quarterly Report for Manufacturing, Mining and Trade. Attachment I contains a copy of Table 4 for the year 1977.

[1]Chemical Engineering, McGraw Hill, Inc., April 28, 1975 and subsequent issues. The compound rate of increase is computed as:

$$\left(\left[\text{(Index in Final Year)} \div \text{(Index in Initial Year)}\right]^{1/N} - 1\right) \times 100$$

where N equals the number of years between the first and last years.

[2]The inflation rate of 8.3 percent is only applicable to the example described in the manual. Actual penalty determination will require calculation of the inflation rate using the above formula and the past Plant Cost Inflation Indices for the most recent twenty quarters.

The annual rates of return on equity after taxes are reported by the FTC in broad industrial categories. To categorize a firm, the Standard Industrial Classification Manual published by the Office of Management and Budget should be used.

The FTC does not report rates of return on equity for public utilities. For these organizations, the annual percent return on net worth published in the April Monthly Economic Letter by Citibank (New York) should be used instead. Attachment I includes a table listing this information for 1973 to 1977.

For the Fertilizer Company, the correct category to use is Chemicals and Allied Products. The calculation of the average return on equity for twenty quarters is shown in Exhibit II-5.

EXHIBIT II-5

FERTILIZER COMPANY
JULY 1978
AVERAGE RETURN ON EQUITY, CHEMICALS AND ALLIED PRODUCTS

YEAR	QUARTER	RETURN %
1973	1	14.4
	2	15.5
	3	14.8
	4	15.5
1974	1	18.1
	2	21.3
	3	18.9
	4	14.8
1975	1	14.2
	2	16.2
	3	15.6
	4	15.2
1976	1	16.6
	2	17.2
	3	15.3
	4	12.8
1977	1	14.9
	2	16.8
	3	14.8
	4	13.8
	Total:	316.7

Average: 15.84%

10. Interest rate. The interest rate is the estimated cost of new debt for the firm. Determination of the firm's interest rate requires two steps.

- The quality rating for the firm's bonds is found in Moody's Bond Record. If the firm does not have rated debt, an "A" rating is assumed. If it has more than one issue, that with the highest rating is used.

- The most recent monthly yield reported for bonds of the same rating is found in the Corporate Bond Yield Averages section of the Bond Record.

Bonds are rated by Moody's in a system ranging from a high of "Aaa" to a low of "C". The lowest average yield reported is "Baa"; a firm whose bonds have a rating of "Baa" or lower will use the yield reports for the "baa" average. The bonds are listed in the Bond Record in alphabetical order by corporation. Convertible bonds are considered in the same manner as all other bonds.

Note that the interest rate is not taken from the so-called coupon rate on the bond. For example, in Table II-1, rates of 9.75 percent and 4.5 percent are listed. These are historical rates which were in effect at the time the bonds were issued. They do not reflect current market rates.

The Bond Record reports a number of different yields. If the firm is a utility, the Public Utility Average is used. If the firm is not a utility, the Industrial Bond average is used.

For the Fertilizer Company, the debt was not rated, so the industrial bond average for "A" bonds is used (8.76). Attachment II contains the average bond yields as reported in a recent issue of the Bond Record.

11. Preferred dividend rate. The method used for determining the preferred dividend rate is identical to that used to select the interest rate. The quality rating of the firm's preferred stock is found in Moody's Bond Record in the Preferred Stock section. If the stock is not rated, an "A" rating is assumed.

Average yields are reported for only "aa", "a", and "baa" preferred stocks issued by utilities. However, these figures should be used for non-utilities as well. If the stock has a rating of "baa" or lower, use the "baa" average yield. Preferred rated "aa" or higher should use the "aa" yield.

The latest monthly average is used and entered exactly as shown in the averages. Attachment III contains an example of the Bond Record preferred averages.

The Fertilizer Company's preferred stock is not rated so the yield entered for the penalty calculation is 8.88 percent, the rate found by using the return on "a" rated preferred stock.

12. Preferred stock share of investment. This is the percentage amount of preferred equity in the firm's capital structure. The capital structure of the firm is the dollar amount invested in the firm for periods over one year. Thus it does not include current liabilities or deferred federal income tax.

The preferred share of the investment is calculated using data contained in the firm's five most recent annual reports.[1] The procedure involves the following steps:

[1] This is available either directly from the firm or, for large corporations, in Moody's Industrial Manual. An advantage to using Moody's is that the percent equity is reported and can be used as a check on the calculation.

- The sum of all the firm's equity accounts on each year's balance sheet is added to the total of its long term debt. This total represents the firm's long term financing or its capital structure for that year. It will include paid-in capital, retained earnings, capital surplus, preferred stock and long term debt. If Treasury stock is shown as an asset on the balance sheet, it should be subtracted from the total capital.
- The dollar amount of all preferred stock shown in the equity section of the balance sheet for the year is divided by the total capital found in the previous step. This is the preferred share of the investment for the year.
- The preferred shares for each of the five most recent years are averaged to yield a preferred share for input to the penalty calculation.

13. Equity share of the investment. The sum of all equity accounts not used in the numerator of the preferred stock calculation is the amount of common equity in the capital structure each year. This sum is also divided by the yearly total capital found in step one yielding the equity share of the investment for the year. These figures are then averaged to yield an equity share for input to the penalty calculation.

The sum of the equity share of the investment and the preferred share of the investment cannot be greater than one hundred percent.

The hypothetical Fertilizer Company has the following balance sheet.

Table II-1

Fertilizer Company
Balance Sheet
December 31, 19[illegible]
(000's)

Assets	1976	Liabilities	
Cash	$18,881	Notes payable to bank	$122
Marketable Securities	[illegible]	[illegible]	[illegible]
Notes & accts. rec.(net)	[illegible]	[illegible]	[illegible]
Income tax refunds		Income tax	28,[illegible]
Inventories	116,940	Current maturities long term debt	8,9[illegible]
Prepaid expenses	4,290	TOTAL CURRENT LIABILITIES	$91,[illegible]
TOTAL CURRENT ASSETS	$279,[illegible]		
		Deferred fed. income taxes	57,6[illegible]
Property-plant & equip.	8[illegible]	[illegible]	[illegible]
Less: reserve for depreciation	423,554	9.7 notes	[illegible]
NET PROPERTY ACCOUNT	$[illegible],149	Long term lease obligation	[illegible]
		Pollution control fedl.rev.bds.	46,[illegible]
Const. funds held by trustee	3,913	Other long term debt	9,[illegible]
Other assets	8[illegible],425	4 1/2 preferred stock ($100 par)	[illegible]
		Common stock ($5 par)	101,000
		Capital surplus	58,[illegible]
		Retained earnings	2[illegible]
		[illegible]	$4[illegible]
		Less: treasury stock	[illegible]
		NET STOCKHOLDER'S EQUITY	$422,60[illegible]
TOTAL	$772,376	TOTAL	$772,376

Exhibit II-6 illustrates the calculation of the equity and preferred share of the investment for a single year.

EXHIBIT II-6

CALCULATION OF THE EQUITY AND PREFERRED SHARE OF THE INVESTMENT[1]
FERTILIZER COMPANY
(000's)

The first step in obtaining the equity and preferred share of the investment is to sum the equity and long term debt.[2]

4.5% debentures	$ 21,531
9.7% notes	60,000
Long term lease	43,932
Pollution control rev bonds	46,000
Other long term debt	9,230
4.5% preferred stock	22,044
Common stock	100,000
Capital surplus	58,236
Retained earnings	262,799
	$623,772
Less: Treasury Stock	(477)
Total long term capital	$623,295

[1]For the purposes of this example, preferred and equity share are calculated for one year only.

[2]Deferred taxes are not included in the calculation of the equity and preferred share of the investment.

EXHIBIT II-6
(CONTINUED)

The second step is to divide the preferred stock by the total long term capital.

$$\frac{\text{Preferred stock}}{\text{Total Long Term Capital}} = \frac{22,044}{623,295} = .035 \text{ or } 3.5\%$$

The third step is to sum all common equity accounts. Do not include the preferred stock. Divide this number by the total long term capital.

Common Stock	$100,000
Capital Surplus	58,236
Retained Earnings	262,799
Total	421,035
Less Treasury Stock	(477)
Total Common Equity	$420,558

$$\frac{\text{Total Common Equity}}{\text{Total Long Term Capital}} = \frac{\$420,558}{623,295} = .675 \text{ or } 67.5\%$$

Thus, 67.5 percent is the equity share of the investment and 3.5 percent is the preferred share of the investment.

14. Depreciation life in years. This is the number of years over which the firm's pollution control equipment will be depreciated for tax purposes. It is found by taking the lower limit on the asset depreciation range for the appropriate class of assets given in the Internal Revenue Service publication Revenue Procedure 77-10. If the lower limit is greater than ten years, the regulations require that ten years be used. If the lower limit contains a fractional part of a year, the program should be run with the year lower than the fraction. If the rounding reduces the investment tax credit, the depreciation life should be rounded up and the program run again. The calculation giving the lower penalty should be used.

15. The useful life in years. The useful life is used to determine the length of each replacement cycle in the penalty calculation. It is also provided by Revenue Procedure 77-10. Instead of using the lower limit, the asset guideline period is used. If this contains a fractional part of a year the number should be rounded up to the next integer. The useful life must always be greater than or equal to the depreciation life in years.

For the Fertilizer Company example, the "Asset Guideline Period" for chemicals and allied products is used. This is eleven years. Had it been 11.5 years, it would have been rounded up to twelve.

Attachment I

TABLE 4. ANNUAL RATES OF PROFIT ON STOCKHOLDERS' EQUITY, BY INDUSTRY

(Percent)

Industry	Before [illegible]								
	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
All Manufacturing Corporations	21.0	21.3	25.1	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Nondurable Manufacturing Corporations	20.5	20.9	24.1	22.1	21.8	[illegible]	[illegible]	[illegible]	[illegible]
Food and Kindred Products	21.7	19.8	24.[illegible]	21.9	20.[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Tobacco Manufactures	27.[illegible]	29.5	3[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Textile Mill Products	9.[illegible]	13.2	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Paper and Allied Products	17.9	17.4	[illegible]	[illegible]	18.[illegible]	10.9	[illegible]	[illegible]	[illegible]
Printing and Publishing	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Chemicals and Allied Products	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Industrial chemicals and synthetics 1/	17.[illegible]	22.[illegible]	26.5	[illegible]	17.[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Drugs 1/	35.[illegible]	29.5	28.6	29.0	22.[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Petroleum and Coal Products	19.[illegible]	19.5	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Rubber and Miscellaneous Plastics Products	20.[illegible]	21.6	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Other Nondurable Manufacturing Corporations	21.8	21.0	27.[illegible]	24.[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Durable Manufacturing Corporations	21.[illegible]	21.7	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Stone, Clay and Glass Products	17.[illegible]	10.1	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Primary Metal Industries	8.[illegible]	7.2	13.9	[illegible]	[illegible]	7.3	[illegible]	[illegible]	[illegible]
Iron and steel 1/	10.0	5.6	12.[illegible]	[illegible]	9.[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Nonferrous metals 1/	6.[illegible]	12.0	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Fabricated Metal Products	22.9	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Machinery, except Electrical	26.[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Electrical and Electronic Equipment	25.3	23.2	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Transportation Equipment	25.[illegible]	19.9	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Motor vehicles and equipment 1/	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Aircraft, guided missiles and parts 1/	21.0	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Instruments and Related Products	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Other Durable Manufacturing Corporations	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
All Mining Corporations	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
All Retail Trade Corporations	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
All Wholesale Trade Corporations	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

1/ Included in Major Industry above.
2/ Taxable profit [illegible] which includes net income (loss) of foreign branches [illegible] in earnings [illegible] nonconsolidated subsidiaries, net of foreign taxes.
3/ Some of the [illegible] in this [illegible] have been revised since their first [illegible] See footnotes to Table A-[illegible].

Attachment I
(Continued)

UTILITY AFTER-TAX RETURN ON EQUITY
(PERCENT)

	Electric Power and Gas	Telephone and Telegraph
1977	11.7	12.7
1976	11.5	11.5
1975	11.6	9.9
1974	10.9	9.8
1973	10.7	10.5

Source: Monthly Economic Letter, Citibank, New York, April 1978 and April issues of prior years.

Attachment II

MOODY'S CORPORATE BOND YIELD AVERAGE

FOR FERTILIZER COMPANY 8.76

Moody's Corporate Bond Yield Averages

	Av. Corp.	Aaa	Corporate by Ratings Aa	A	Baa	Corporate by Groups P.U.	Ind.	R.R.	Public Utility Bonds Aaa	Aa	A	Baa	Industrial Bonds Aaa	Aa	A	Baa		Railroad Bonds Aaa	Aa	A
1977																				
June	7.66	7.23	7.51	7.68	8.25	7.83	7.76	7.98	June	7.53	7.71	7.77	8.01	June	6.93	7.11	7.27	8.01	June	---	7.72	7.94
July	7.66	7.21	7.50	7.71	8.25	7.80	7.79	8.00	July	7.43	7.58	7.62	8.06	July	6.94	7.17	7.30	8.01	July	---	7.75	7.93
Aug.	7.61	7.19	7.43	7.64	8.18	7.80	7.75	7.98	Aug.	7.41	7.59	7.64	8.01	Aug.	6.94	7.19	7.35	8.00	Aug.	---	7.70	7.92
Sept.	7.59	7.17	7.43	7.60	8.19	7.83	7.68	7.97	Sept.	7.41	7.58	7.61	8.01	Sept.	7.03	7.18	7.33	7.95	Sept.	---	7.68	7.91
Oct.	7.59	7.21	7.45	7.56	8.26	7.83	7.74	7.97	Oct.	7.43	7.62	7.66	7.91	Oct.	7.01	7.22	7.34	7.98	Oct.	---	7.71	7.91
Nov.	7.58	7.17	7.43	7.57	8.27	7.84	7.73	7.98	Nov.	7.41	7.61	7.62	7.98	Nov.	6.96	7.08	7.29	7.98	Nov.	---	7.73	7.97
Dec.	7.47	7.08	7.34	7.50	7.93	7.68	7.59	7.91	Dec.	7.24	7.36	7.46	7.78	Dec.	6.90	6.97	7.23	7.88	Dec.	---	7.72	7.79
1978																				
Jan.	7.49	7.15	7.37	7.53	7.88	7.53	7.37	7.87	Jan.	7.33	7.43	7.58	7.77	Jan.	6.96	7.04	7.26	7.88	Jan.	---	7.67	7.79
Feb.	7.57	7.22	7.47	7.60	7.97	7.61	7.45	7.96	Feb.	7.41	7.52	7.62	7.98	Feb.	7.04	7.12	7.35	7.83	Feb.	---	7.73	7.81
Mar.	7.62	7.29	7.49	7.66	8.00	7.64	7.49	7.94	Mar.	7.43	7.58	7.66	7.93	Mar.	7.12	7.20	7.40	7.94	Mar.	---	7.77	7.87
Apr.	7.62	7.29	7.49	7.64	8.00	7.64	7.49	7.98	Apr.	7.44	7.51	7.62	7.99	Apr.	7.18	7.19	7.46	8.00	Apr.	---	7.77	7.86
May	7.62	7.29	7.49	7.66	8.00	7.64	7.51	8.01	May	7.44	7.51	7.62	8.01	May	7.18	7.19	7.41	7.98	May	---	7.76	7.89
June	7.69	7.37	7.55	7.71	8.13	7.69	7.68	8.07	June	7.51	7.59	7.71	7.96	June	7.25	7.26	7.48	7.99	June	---	7.79	7.91
July	7.80	7.43	7.64	7.88	8.18	7.81	7.80	8.17	July	7.61	7.70	7.82	8.18	July	7.28	7.38	7.64	8.19	July	---	7.87	8.12
Aug.	8.04	7.68	7.84	8.11	8.38	8.06	7.97	8.35	Aug.	7.81	7.92	8.04	8.47	Aug.	7.56	7.62	8.02	8.51	Aug.	---	8.02	8.27
Sept.	8.06	7.63	7.88	8.11	8.43	8.09	7.99	8.37	Sept.	7.78	7.84	8.04	8.63	Sept.	7.48	7.73	7.99	8.55	Sept.	---	7.91	8.29
Oct.	7.98	7.68	7.84	7.98	8.45	8.05	7.78	8.26	Oct.	7.77	7.96	8.03	8.44	Oct.	7.43	7.67	7.96	8.15	Oct.	---	7.92	8.13
Nov.	8.01	7.67	7.96	8.07	8.43	8.11	7.81	8.29	Nov.	7.83	8.01	8.15	8.44	Nov.	7.58	7.67	7.98	8.17	Nov.	---	8.03	8.17
Dec.	8.06	7.68	7.98	8.13	8.46	8.17	7.84	8.28	Dec.	7.86	8.07	8.24	8.51	Dec.	7.50	7.68	7.98	8.20	Dec.	---	7.99	8.20
1979																				
Jan.	8.13	7.83	8.09	8.17	8.48	8.23	7.97	8.34	Jan.	8.00	8.15	8.30	8.58	Jan.	7.66	7.85	7.98	8.39	Jan.	---	7.98	8.22
Feb.	8.17	7.88	8.16	8.23	8.53	8.25	8.01	8.37	Feb.	8.01	8.20	8.40	8.66	Feb.	7.70	7.98	8.07	8.37	Feb.	---	7.98	8.29
Mar.	8.28	8.01	8.18	8.38	8.68	8.44	8.13	8.46	Mar.	8.14	8.35	8.48	8.81	Mar.	7.87	8.09	8.19	8.62	Mar.	---	7.99	8.38
Apr.	8.34	8.23	8.43	8.41	8.67	8.60	8.30	8.51	Apr.	8.26	8.44	8.51	8.84	Apr.	8.03	8.29	8.45	8.68	Apr.	---	8.09	8.53
May	8.71	8.37	8.58	8.88	9.05	8.98	8.48	8.73	May	8.47	8.71	9.00	9.23	May	8.28	8.66	8.66	8.85	May	---	8.19	8.68
June	8.89	8.47	8.73	9.07	9.27	9.08	8.68	8.88	June	8.58	8.92	9.15	9.48	June	8.34	8.57	8.68	9.03	June	---	8.29	8.91
July	9.15	8.72	9.01	9.40	9.48	9.34	8.98	9.07	July	8.83	9.17	9.48	9.72	July	8.66	8.93	9.13	9.23	July	---	8.56	9.27
Aug.	9.33	9.00	9.29	9.47	9.77	9.59	9.16	9.26	Aug.	9.01	9.32	9.63	10.16	Aug.	8.89	9.03	9.21	9.39	Aug.	---	8.61	9.50
Sept.	9.78	9.24	9.66	10.06	10.18	10.11	9.54	9.46	Sept.	9.36	9.69	10.03	10.59	Sept.	9.12	9.35	9.62	9.78	Sept.	---	8.94	9.84
Oct.	9.92	9.37	9.84	10.29	10.48	10.31	9.53	9.44	Oct.	9.46	9.83	[illegible]	11.05	Oct.	9.43	9.55	9.98	9.93	Oct.	---	8.92	9.71
Nov.	9.72	9.28	9.54	9.98	10.40	10.14	9.27	9.44	Nov.	9.30	9.64	9.98	11.38	Nov.	9.09	9.13	9.46	9.91	Nov.	---	8.77	9.59
Dec.	9.63	9.09	9.39	9.86	10.25	10.02	9.23	9.39	Dec.	9.02	9.37	10.27	11.40	Dec.	8.76	9.03	9.31	9.85	Dec.	---	8.68	9.57
1980																				
Jan.	9.65	8.83	9.15	9.85	10.01	10.10	9.10	9.28	Jan.	8.99	9.43	10.17	11.37	Jan.	8.68	8.81	9.25	10.02	Jan.	---	8.79	9.06
Feb.	9.63	8.82	8.91	9.91	10.46	9.83	9.01	9.28	Feb.	8.78	9.23	9.99	11.32	Feb.	8.46	8.66	9.03	9.96	Feb.	---	8.59	9.06
Mar.	9.28	8.61	8.69	9.37	10.08	9.67	9.03	8.98	Mar.	8.62	9.17	9.73	10.94	Mar.	8.26	8.52	8.87	10.11	Mar.	---	8.43	8.75
Apr.	9.58	8.96	8.9	9.62	10.38	9.88	9.30	9.27	Apr.	8.71	9.48	10.06	10.98	Apr.	8.28	8.89	9.22	10.38	Apr.	---	8.79	9.01
May	9.64	8.99	9.04	9.79	10.85	9.98	9.37	9.40	May	9.03	9.40	10.23	10.93	May	8.75	8.98	9.38	10.48	May	---	8.96	9.19
June	9.55	8.77	9.3	9.67	10.62	9.81	9.29	9.40	June	8.82	9.34	10.18	10.83	June	8.61	8.91	9.23	10.43	June	---	8.56	9.68
July	9.54	8.84	9.3	9.61	10.56	9.81	9.28	9.37	July	8.94	9.36	10.01	10.80	July	8.62	8.88	9.22	10.40	July	---	8.54	9.67
Aug.	9.61	8.85	9.23	9.68	10.59	9.85	9.29	9.31	Aug.	8.90	9.32	10.18	10.97	Aug.	8.69	8.94	9.23	10.31	Aug.	---	8.69	9.74
Sept.	9.87	8.93	9.38	9.74	10.81	9.96	9.35	9.43	Sept.	9.11	9.64	10.19	10.99	Sept.	8.98	9.06	9.29	10.23	Sept.	---	8.91	9.78
Oct.	9.93	8.96	9.39	9.72	10.82	9.94	9.32	9.43	Oct.	9.14	9.63	10.18	10.98	Oct.	9.17	9.08	9.27	10.34	Oct.	---	9.04	9.77
Nov.	9.55	8.78	9.23	9.64	10.56	9.83	9.27	9.36	Nov.	9.03	9.43	10.04	10.78	Nov.	8.52	8.80	9.26	10.23	Nov.	---	8.68	9.72
Dec.	9.37	8.79	9.25	9.57	10.48	9.67	9.20	9.37	Dec.	9.07	9.31	10.11	10.78	Dec.	8.51	8.90	9.23	10.13	Dec.	---	8.47	9.68
1981																				
Jan.	9.48	8.89	9.13	9.36	10.41	9.88	9.16	9.29	Jan.	8.86	9.09	9.90	10.53	Jan.	8.33	8.97	9.18	10.36	Jan.	---	8.61	9.68
Feb.	9.21	8.65	9.08	9.43	10.24	9.69	9.12	9.25	Feb.	8.86	9.16	9.71	10.31	Feb.	8.29	8.87	9.18	10.17	Feb.	---	8.38	9.54
Mar.	9.28	8.53	9.01	9.40	10.13	9.43	9.10	9.25	Mar.	8.74	9.12	9.67	10.17	Mar.	8.30	8.98	9.12	10.07	Mar.	---	8.38	9.47
Apr.	9.12	8.49	8.90	9.26	9.96	9.27	8.98	9.16	Apr.	8.69	9.04	9.53	9.93	Apr.	8.16	8.78	9.08	9.82	Apr.	---	8.23	9.27
May	9.16	8.48	8.98	9.28	9.98	9.31	9.00	9.18	May	8.73	9.04	9.55	9.91	May	8.43	8.78	9.09	9.81	May	---	8.34	9.17
June	9.14	8.46	8.89	9.24	9.99	9.35	8.98	9.15	June	8.64	9.07	9.54	10.01	June	8.40	8.71	8.97	9.78	June	---	8.17	9.11
July	9.08	8.36	8.81	9.14	9.92	9.26	8.90	9.01	July	8.54	8.92	9.51	9.88	July	8.23	8.59	8.91	9.75	July	---	8.06	9.11
Aug.	9.05	8.45	8.86	9.18	9.94	9.27	8.93	8.95	Aug.	8.54	8.83	9.13	9.87	Aug.	8.29	8.69	8.92	9.81	Aug.	---	7.99	9.08
Sept.	8.79	8.38	8.74	8.91	9.60	8.94	8.66	8.69	Sept.	8.37	8.63	8.90	9.67	Sept.	8.18	8.29	8.72	9.53	Sept.	---	7.98	8.92
Oct.	8.71	8.32	8.68	8.73	9.29	8.83	8.56	8.56	Oct.	8.30	8.62	8.79	9.61	Oct.	8.14	8.28	8.68	9.17	Oct.	---	7.82	8.83
Nov.	8.66	8.26	8.59	8.72	9.22	8.77	8.51	8.56	Nov.	8.25	8.52	8.76	9.56	Nov.	8.15	8.30	8.63	9.19	Nov.	---	7.82	8.82
Dec.	8.67	8.28	8.54	8.73	9.13	8.81	8.53	8.59	Dec.	8.13	8.48	8.63	9.21	Dec.	7.91	8.04	8.43	9.03	Dec.	---	7.67	8.69
1982																				
Jan.	8.41	7.98	8.16	8.43	9.08	8.39	8.24	8.39	Jan.	8.16	8.41	8.61	9.17	Jan.	7.77	7.90	8.18	8.99	Jan.	---	7.82	8.34
Feb.	8.48	8.06	8.26	8.49	9.12	8.62	8.33	8.39	Feb.	8.21	8.44	8.65	9.19	Feb.	7.78	8.06	8.33	9.14	Feb.	---	7.88	8.32
Mar.	8.51	8.10	8.28	8.53	9.17	8.65	8.38	8.42	Mar.	8.26	8.47	8.68	9.23	Mar.	7.82	8.07	8.40	9.24	Mar.	---	7.93	8.43
Apr.	8.49	8.06	8.28	8.53	9.07	8.65	8.38	8.37	Apr.	8.24	8.45	8.71	9.17	Apr.	7.84	8.03	8.39	9.07	Apr.	---	7.93	8.37
May	8.47	8.05	8.25	8.48	9.01	8.64	8.38	8.31	May	8.21	8.43	8.68	9.13	May	7.87	8.02	8.38	8.98	May	---	7.91	8.21
June	8.38	7.93	8.19	8.48	8.91	8.53	8.23	8.18	June	8.11	8.37	8.68	9.03	June	7.77	7.88	8.33	8.98	June	---	7.75	8.08
July	8.31	7.94	8.17	8.40	8.87	8.48	8.19	8.02	July	8.10	8.32	8.61	8.97	July	7.78	7.92	8.29	8.93	July	---	7.73	7.99
Aug.	8.34	7.98	8.17	8.40	8.92	8.47	8.21	8.03	Aug.	8.13	8.34	8.63	8.91	Aug.	7.82	7.97	8.30	8.92	Aug.	---	7.76	7.98
Sept.	8.31	7.92	8.15	8.37	8.90	8.45	8.19	8.03	Sept.	8.07	8.33	8.60	8.88	Sept.	7.78	7.97	8.27	8.74	Sept.	---	7.82	7.93
Oct.	8.42	8.01	8.24	8.48	8.99	8.54	8.27	8.07	Oct.	8.16	8.44	8.71	8.91	Oct.	7.85	8.09	8.33	8.77	Oct.	---	7.94	7.97
Nov.	8.48	8.08	8.34	8.58	8.93	8.61	8.36	8.10	Nov.	8.23	8.48	8.84	9.08	Nov.	7.93	8.20	8.48	8.94	Nov.	---	8.09	7.91
Dec.	8.54	8.13	8.40	8.67	8.99	8.65	8.42	8.18	Dec.	8.34	8.53	8.84	9.08	Dec.	8.04	8.23	8.49	8.90	Dec.	---	8.23	7.93
1983																				
Jan.	8.74	8.41	8.59	8.78	9.17	8.87	8.80	8.29	Jan.	8.53	8.68	8.92	9.27	Jan.	8.31	8.62	8.80	9.07	Jan.	---	7.93	8.04
Feb.	8.78	8.47	8.65	8.79	9.20	8.93	8.83	8.32	Feb.	8.58	8.73	8.97	9.35	Feb.	8.37	8.68	8.82	9.11	Feb.	---	8.00	8.18
Mar.	8.83	8.47	8.66	8.83	9.22	8.93	8.86	8.41	Mar.	8.57	8.73	8.96	9.31	Mar.	8.36	8.53	8.68	9.07	Mar.	---	8.10	8.10
Apr.	8.68	8.36	8.73	8.84	9.32	8.93	8.12	8.48	Apr.	8.49	8.64	8.98	9.34	Apr.	8.43	8.59	8.76	9.10	Apr.	--	8.09	8.15

Attachment III

MOODY'S PUBLIC UTILITY PREFERRED STOCK YIELD AVERAGE

FOR FERTILIZER COMPANY 8.88

Moody's Public Utility Preferred Stock Yield Averages

	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
1978	8.76	8.76	8.82	8.77	8.86	8.92	8.98	9.12	9.04	9.02	9.21	9.28
1979	9.19	9.24	9.33	9.31	9.38	9.43	9.50	9.58	9.62	9.63	9.69	9.76
1978	8.34	8.36	8.39	8.51	---	---	---	---	---	---	---	---

"a"

	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
1978	8.46	8.43	8.48	8.34	8.46	8.49	8.55	8.70	8.63	8.59	8.78	8.85
1979	8.88	8.90	8.95	8.91	8.84	8.87	8.93	9.01	9.06	9.06	9.12	9.19
1978	8.70	8.70	8.79	8.80	---	---	---	---	---	---	---	---

"baa"

	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
1978	8.79	8.77	8.82	8.78	8.79	8.79	8.70	8.96	8.88	8.84	9.03	9.10
1979	9.01	9.06	9.15	9.13	9.04	9.13	9.19	9.27	9.31	9.31	9.37	9.44
1978	8.70	8.70	8.79	8.80	---	---	---	---	---	---	---	---

NOTE: There is no "a" average because of the dearth of prime-quality preferred stocks. Yields are based on prices for the last Friday of each month.

Title	Moody's Rating	Dividend Dates	Par or Stated Value	Shares Outstanding (000's)	Current Call Price	Sinking Fund	Either Money Preferred
Alabama Power Co.							
4.20% Cum. preferred	"baa"	J. A. J. & O.	100	264	105.00 (no change)	No	No
4.32% Cum. preferred	"baa"	J. A. J. & O.	100	50	102.50 (no change)	No	Yes
4.60% Cum. preferred	"baa"	J. A. J. & O.	100	100	104.20 (no change)	No	Yes
4.64% Cum. preferred	"baa"	J. A. J. & O.	100	60	104.30 (to 5-1-79)	No	Yes
4.72% Cum. preferred	"baa"	J. A. J. & O.	100	80	102.36 (to 5-1-80)	No	Yes
4.92% Cum. preferred	"baa"	J. A. J. & O.	100	60	102.23 (no change)	No	Yes
5.20% Cum. preferred	"baa"	J. A. J. & O.	100	70	106.88 (to 10-1-81)	No	Yes
6.88% Cum. preferred	"baa"	J. A. J. & O.	100	100	106.34 (to 11-1-78)	No	Yes
9.24% Cum. preferred	"baa"	J. A. J. & O.	100	100	108.46 (to 11-1-80)	No	Yes
8.28% Cum. preferred	"baa"	J. A. J. & O.	100	200	108.43 (to 1-1-82)	No	Yes
8.04% Cum. preferred	"baa"	J. A. J. & O.	100	200	107.80 (to 6-1-82)	No	Yes
8.16% Cum. preferred	"baa"	J. A. J. & O.	100	200	109.66 (to 12-1-78)	No	Yes
9.44% Cum. preferred, 1976 Series	"baa"	J. A. J. & O.	100	200	110.00 (Fr. 6-1-79)	No	Yes
11% Cum. preferred	"baa"	J. A. J. & O.	100	200	111.00 (Fr. 12-1-81)	No	Yes
9% Cum. preferred	"baa"	J. A. J. & O.	100	200	108.00 (Fr. 9-1-80)	No	Yes
Bell 72% {Cum. preferred / Depositary preferred	"baa"	J. A. J. & O. / J. A. J. & O.	100 / --	[illegible] / [illegible]	108.72 (Fr. 12-1-80) / ----	No / ---	Yes / ---
AMAX Inc.							
$2 Cv. preferred ser. B	"a"	M. J. S. & D.	100	2,000	102.00 (to 3-1-79)	No	Yes
American Airlines Inc.							
$2.1875 Cum. preferred units	"baa"	J. A. J. & O.	100	2,000	53.00 (Fr. 6-1-82)	$1/qtr.	Yes
American Telephone & Telegraph Co.							
$4.50 Cum. conv. preferred	"aaa"	F. M. A. & N.	50	27,000	54.00 (no change)	No	Yes
$3.64 Cum. preferred	"aaa"	F. M. A. & N.	25	10,000	103.13 (to 4-30-79)	$1/qtr.	Yes
$3.74 Cum. preferred	"aaa"	F. M. A. & N.	25	10,000	103.18 (to 1-31-81)	$1/qtr.	Yes
Appalachian Power Company							
4.50% Cum. preferred	"baa"	F. M. A. & N.	100	200	110.00 (no change)	No	No
4.50% Cum. Preferred	"baa"	F. M. A. & N.	100	75	102.00 (no change)	Yes	Yes
4.40% Cum. preferred	"baa"	F. M. A. & N.	100	100	106.92 (to 2-1-82)	No	Yes
8.12% Cum. preferred	"baa"	F. M. A. & N.	100	200	107.50 (to 2-31-81)	No	Yes
8.52% Cum. preferred	"baa"	F. M. A. & N.	100	200	109.00 (Fr. 2-1-79)	No	Yes
Arizona Public Service Co.							
$1.00 Cum. preferred	"a"	M. J. S. & D.	25	100	27.00 (no change)	No	---
$2.50 Cum. preferred	"a"	M. J. S. & D.	50	100	51.00 (no change)	No	Yes
$2.36 Cum. preferred	"a"	M. J. S. & D.	50	60	51.00 (no change)	No	Yes
$2.40 Cum. preferred, ser. A	"a"	M. J. S. & D.	50	200	50.50 (no change)	No	Yes
$2.10 Cum. preferred, ser. E	"a"	M. J. S. & D.	50	200	51.50 (to 5-28-83)	No	Yes
$10.70 Cum. preferred, ser. I	"a"	M. J. S. & D.	100	200	110.70 (Fr. 12-1-80)	Yes	Yes
$9.32 Cum. preferred, Ser. J	"a"	M. J. S. & D.	100	200	108.32 (Fr. 9-1-82)	Yes	Yes

Notes: Moody's ratings are subject to change. Because of the possible time lapse between Moody's assignment or change of a rating and your use of this monthly publication, we suggest you verify the current rating of any security or issuer in which you are interested.

PROPOSED RULES

II-36

Attachment IV

This attachment is IRS Revenue Procedure 77-10.

Revenue Procedure 77-10
Administrative, Procedural, and Miscellaneous

Reprinted from Internal Revenue Bulletin No. 12,
dated March 21, 1977

Department of the Treasury

26 CFR 601.105: Examination of returns and claims for refund, credit, or abatement; determination of correct tax liability.

Rev. Proc. 77-10

SECTION 1. PURPOSE.

.01 The purpose of this Revenue Procedure is to restate, pursuant to sections 167(m) and 263(f) of the Internal Revenue Code of 1954, with certain substantive modifications as noted below, the asset guideline classes, asset guideline depreciation periods and ranges, and annual asset guideline repair allowance percentages for the Class Life Asset Depreciation Range (CLADR) System.

.02 This Revenue Procedure supersedes Rev. Proc. 72-10, 1972-1 C.B. 721, and the supplements and revisions of the asset guideline classes, periods, and repair allowance percentages published since the publication of Rev. Proc. 72-10. These Revenue Procedures are as follows:

73-2, 1973-1 C.B. 747
73-3, 1973-1 C.B. 749
73-23, 1973-2 C.B. 474
73-24, 1973-2 C.B. 475
73-25, 1973-2 C.B. 477
73-26, 1973-2 C.B. 479
73-27, 1973-2 C.B. 480
73-28, 1973-2 C.B. 482
73-30, 1973-2 C.B. 484
74-27, 1974-2 C.B. 480
74-28, 1974-2 C.B. 481
74-29, 1974-2 C.B. 482
74-30, 1974-2 C.B. 483
74-31, 1974-2 C.B. 487
74-32, 1974-2 C.B. 487
74-37, 1974-2 C.B. 491
74-50, 1974-2 C.B. 506
76-16, 1976-1 C.B. 556
76-17, 1976-1 C.B. 557
76-18, 1976-1 C.B. 559
76-27, 1976-2 C.B. 644
76-37, 1976-2 C.B. 659
77-2, 1977-3 I.R.B. 24
77-3, 1977-3 I.R.B. 24
77-8, 1977-10 I.R.B. 12

.03 In addition, certain changes are made in the numbering system of asset guideline classes to facilitate the understanding and use of the CLADR system.

Broad title headings and asset guideline class number designations for several related guideline classes have been deleted wherever feasible to eliminate confusion over the appropriate asset guideline class number designations.

The asset guideline classes for "Office Furniture, Fixtures, and Equipment," "Information System," and "Data Handling Equipment, except Computers," were established in Rev. Proc. 73-2 as asset guideline classes 70.11, 70.12, and 70.13, respectively. These classes have been redesignated asset guideline classes 00.11, 00.12, and 00.13, respectively. In addition, the asset guideline class for Industrial Steam and Electric Generation and Distribution Systems, designated asset guideline class 49.5, has been redesignated asset guideline class 00.4. The redesignations group these asset guideline classes with certain other asset guideline classes by types of depreciable assets rather than by the activity or the product of an activity.

04 Numerous changes and modifications have been made to the language of the asset guideline class descriptions. These changes are not intended to modify the composition of the existing classes of Rev. Proc. 72-10.

.05 The following substantive modifications of the classes of Rev. Proc. 72-10 have been made:

(i) Assets used in the ginning of cotton have been reclassified from class 39.0 to class 01.1.

(ii) Assets used by plumbing contractors have been reclassified from class 70.2 to class 15.1.

(iii) The description of assets included in class 15.2, "Marine Contract Construction," has been modified to be consistent with Rev. Proc. 66-18, 1966-1 C.B. 646.

(iv) Subclass 49.121, "Electric Utility Nuclear Fuel Assemblies," is part of class 49.12, "Electric Utility Nuclear Production Plant," to which it is related. Assets included in subclass 49.121 are not separately subject to possible exclusion from an election to apply section 1.167(a)-11(b)(5)(v) of the regulations. See Section 2.02(i) of this Revenue Procedure.

SEC. 2. RULE OF APPLICATION

.01 The asset guideline classes, asset guideline periods and ranges, and annual asset guideline repair allowances percentages set forth are for use under the rules set forth in section 1.167(a)-11 of the Income Tax Regulations.

.02 It should be noted that the following special rules apply as specified:

(i) It is expressly provided that asset guideline classes and subclasses 00.4, 20.5, 30.11, 30.21, 32.11, 33.11, 33.21, 34.01, 35.11, 35.21, 36.11, 37.12, 37.32, 37.33, and 49.121 are part of existing activity classes to which the assets included in them relate as stated in the Revenue Procedures establishing these subclasses; therefore, assets included in these classes and subclasses are not separately subject to possible exclusion from an election to apply section 1.167(a)-11(b)(5)(v) of the regulations.

(ii) "Service assets," as defined in classes 50.1 and 70.21, the cost of which is properly deductible under section 162 of the Code, are not eligible property under the CLADR system. Further, service assets may be treated as mass assets as defined in section 1.47-1(e)(4) of the regulations. Service assets may be depreciated under a method not described in section 167(b)(1), (2), or (3), if the requirements of section 1.167(a)-11(b)(5)(v) are met.

(iii) If the asset guideline class repair allowance for class 32.1 is elected in accordance with section 1.167(a)-11(d)(2)(ii) of the regulations, "cold tank repairs," including refractory relining expenditures to glass furnaces, shall be treated as deductible repairs within the provisions and limitations of section 1.167(a)-11(d)(2)(iv)(a) dealing with the application of the asset guideline class repair allowance.

(iv) General rebuilding or rehabilitation costs for the special tools defined in class 30.11 that have been traditionally capitalized as the cost of a new asset are included in class 30.11.

(v) Asset guideline class 00.3, "Land Improvements," includes "other tangible property" that qualifies under section 1.48-1(d) of the regulations. However, a structure that is essentially an item of machinery or equip-

ment or a structure that houses property used as an integral part of an activity specified in section 48(a)(1)(B)(i) of the Code, if the use of the structure is so closely related to the use of the property that the structure clearly can be expected to be replaced when the property it initially houses is replaced, is included in the asset guideline class appropriate to the equipment to which it is related.

.03 Property that is used predominantly outside the United States may be eligible property if the requirements of section 1.167(a)-11(b)(2) of the regulations are met. In the case of property first placed in service and used predominantly outside the United States during the taxable year of election, an asset guideline period, but no asset depreciation range is in effect. Accordingly, such property shall not be treated as included in the same asset guideline class as property used predominantly inside the United States, for purposes of determining the asset depreciation period under section 1.167(a)-11(b)(4). Thus, for this purpose each asset guideline class described in this Revenue Procedure has an exact counterpart that consists of property otherwise includable within the class, but used predominantly outside the United States during the taxable year of election. Generally, for this purpose property is used predominantly outside the United States if such property is physically located outside the United States during more than 50 percent of days of the taxable year of election, beginning with the date the property is first placed in service. However, there are ten exceptions to this general rule and these are contained in section 48(a)(2) of the Code. The asset depreciation period for property, which is determined in the taxable year of election, will not be changed because of a change in predominant use after the close of such taxable year. Although treated as in a separate class for purposes of determining the asset depreciation period, property predominantly used outside the United States shall be included in the same asset guideline class as property predominantly used inside the United States for purposes of applying the asset guideline class repair allowance under section 1.167(a)-11(d)(2).

SEC. 3. ASSET GUIDELINE CLASSES AND PERIODS, ASSET DEPRECIATION RANGES, AND ANNUAL ASSET GUIDELINE REPAIR ALLOWANCE PERCENTAGES.

The asset guideline classes, asset guideline periods, asset depreciation ranges, and annual asset guideline repair allowance percentages are prescribed as set forth below:

Asset guideline class	Description of assets included	Asset depreciation range (in years)			Annual asset guideline repair allowance percentage
		Lower limit	Asset guideline period	Upper limit	
SPECIFIC DEPRECIABLE ASSETS USED IN ALL BUSINESS ACTIVITIES, EXCEPT AS NOTED:					
00.11	**Office Furniture, Fixtures, and Equipment:** Includes furniture and fixtures which are not a structural component of a building. Includes such assets as desks, files, safes, and communications equipment. Does not include communications equipment that is included in other CLADR classes	8	10	12	2
00.12	**Information Systems:** Includes computers and their peripheral equipment used in administering normal business transactions and the maintenance of business records, their retrieval and analysis. Information systems are defined as: 1) Computers: A computer is an electronically activated device capable of accepting information, applying prescribed processes to the information, and supplying the results of these processes with or without human intervention. It usually consists of a central processing unit containing extensive storage, logic, arithmetic, and control capabilities. Excluded from this category are adding machines, electronic desk calculators, etc. 2) Peripheral equipment consists of the auxiliary machines which may be placed under control of the central processing unit. Non limiting examples are: Card readers, card punches, magnetic tape feeds, high speed printers, optical character readers, tape cassettes, mass storage units, paper tape equipment, keypunches, data entry devices, teleprinters, terminals, tape drives, disc drives, disc files, disc packs, visual image projector tubes, card sorters, plotters, and collators. Peripheral equipment may be used on-line or off-line.				

Asset guideline class	Description of assets included	Asset depreciation range (in years) Lower limit	Asset guideline period	Upper limit	Annual asset guideline repair allowance percentage
	Does not include equipment that is an integral part of other capital equipment and which is included in other CLADR classes of economic activity, i.e., computers used primarily for process or production control, switching and channeling	5	6	7	7.5
00.13	**Data Handling Equipment, except Computers:** Includes only typewriters, calculators, adding and accounting machines, copiers, and duplicating equipment	5	6	7	15
00.21	**Airplanes (airframes and engines),** except those used in commercial or contract carrying of passengers or freight, and all helicopters (airframes and engines)	5	6	7	14
00.22	**Automobiles, Taxis**	2.5	3	3.5	16.5
00.23	**Buses**	7	9	11	11.5
00.241	**Light General Purpose Trucks:** Includes trucks for use over the road (actual unloaded weight less than 13,000 pounds)	3	4	5	16.5
00.242	**Heavy General Purpose Trucks:** Includes heavy general purpose trucks, concrete ready-mix truckers, and ore trucks, for use over the road (actual unloaded weight 13,000 pounds or more)	5	6	7	10
00.25	**Railroad Cars and Locomotives,** except those owned by railroad transportation companies	12	15	18	8
00.26	**Tractor Units For Use Over-The-Road**	3	4	5	16.5
00.27	**Trailers and Trailer-Mounted Containers**	5	6	7	10
00.28	**Vessels, Barges, Tugs, and Similar Water Transportation Equipment,** except those used in marine contract construction	14.5	18	21.5	6
00.3	**Land Improvements:** Includes improvements directly to or added to land, whether such improvements are section 1245 property or section 1250 property, provided such improvements are depreciable. Examples of such assets might include sidewalks, roads, canals, waterways, drainage facilities, sewers, wharves and docks, bridges, fences, landscaping, shrubbery, or radio and television transmitting towers. Does not include land improvements that are explicitly included in any other class, and buildings and structural components as defined in section 1.48-1(e) of the regulations. Excludes public utility initial clearing and grading land improvements as specified in Rev. Rul. 72-403, 1972-2 C.B. 102.		20		
00.4	**Industrial Steam and Electric Generation and/or Distribution Systems:** Includes assets, whether such assets are section 1245 property or 1250 property, providing such assets are depreciable, used in the production and/or distribution of electricity with rated total capacity in excess of 500 Kilowatts and/or assets used in the production and/or distribution of steam with rated total capacity in excess of 12,500 pounds per hour, for use by the taxpayer in his industrial manufacturing process or plant activity and not ordinarily available for sale to others. Does not include buildings and structural components as defined in section 1.48-1(e) of the regulations. Assets used to generate and/or distribute electricity or steam of the type described above of lesser rated capacity are not included, but are included in the appropriate manufacturing equipment classes elsewhere specified.				

Asset guideline class	Description of assets included	Asset depreciation range (in years)			Annual guideline repair allowance percentage
		Lower limit	Asset guideline period	Upper limit	
	Steam and chemical recovery boiler systems used for the recovery and regeneration of chemicals used in manufacturing, with rated capacity in excess of that described above, with specifically related distribution and return systems are not included but are included in appropriate manufacturing equipment classes elsewhere specified. An example of an excluded steam and recovery boiler system is that used in the pulp and paper manufacturing industry	22.5	28	33.5	2.5
	DEPRECIABLE ASSETS USED IN THE FOLLOWING ACTIVITIES:				
01.1	**Agriculture:** Includes machinery and equipment, grain bins, and fences but no other land improvements, that are used in the production of crops or plants, vines, and trees; livestock; the operation of farm dairies, nurseries, greenhouses, sod farms, mushroom cellars, cranberry bogs, apiaries, and fur farms; the performance of agricultural, animal husbandry, and horticultural services	8	10	12	11
01.11	**Cotton Ginning Assets**	9.5	12	14.5	5.5
01.21	**Cattle, Breeding or Dairy**	5.5	7	8.5	
01.22	**Horses, Breeding or Work**	8	10	12	
01.23	**Hogs, Breeding**	2.5	3	3.5	
01.24	**Sheep and Goats, Breeding**	4	5	6	
01.3	**Farm Buildings**	20	25	30	5
10.0	**Mining:** Includes assets used in the mining and quarrying of metallic and nonmetallic minerals (including sand, gravel, stone, and clay) and the milling, beneficiation and other primary preparation of such materials	8	10	12	6.5
13.1	**Drilling of Oil and Gas Wells:** Includes assets used in the drilling of onshore oil and gas wells and the provisions of geophysical and other exploration services; and the provision of such oil and gas field services as chemical treatment, plugging and abandoning of wells and cementing or perforating well casings. Does not include assets used in the performance of any of these activities and services by integrated petroleum and natural gas producers for their own account	5	6	7	10
13.2	**Exploration for and Production of Petroleum and Natural Gas Deposits:** Includes assets used by petroleum and natural gas producers for drilling of wells and production of petroleum and natural gas, including gathering pipelines and related storage facilities	11	14	17	4.5
13.3	**Petroleum Refining:** Includes assets used for the distillation, fractionation, and catalytic cracking of crude petroleum into gasoline and its other components	13	16	19	7
13.4	**Marketing of Petroleum and Petroleum Products:** Includes assets used in marketing petroleum and petroleum products, such as related storage facilities and complete service stations, but not including any of these facilities related to petroleum and natural gas trunk pipelines	13	16	19	4

Asset guideline class	Description of assets included	Asset depreciation range (in years)			Annual asset guideline repair allowance percentage
		Lower limit	Asset guideline period	Upper limit	
15.1	**Contract Construction Other than Marine:** Includes assets used by general building, special trade, and heavy construction contractors. Does not include assets used by companies in performing construction services for their own account	4	5	6	12.5
15.2	**Marine Contract Construction:** Includes assets used by general building, special trade, and heavy construction contractors predominantly in marine construction work. Does not include assets used by companies in performing marine construction services for their own account except for floating, self-propelled, and other drilling platforms and support vessels used in offshore drilling for oil and gas which are included whether used for their own account or others	9.5	12	14.5	5
20.1	**Manufacture of Grain and Grain Mill Products:** Includes assets used in the production of flours, cereals, livestock feeds, and other grain and grain mill products	13.5	17	20.5	6
20.2	**Manufacture of Sugar and Sugar Products:** Includes assets used in the production of raw sugar, syrup, or finished sugar from sugar cane or sugar beets	14.5	18	21.5	4.5
20.3	**Manufacture of Vegetable Oils and Vegetable Oil Products:** Includes assets used in the production of oil from vegetable materials and the manufacture of related vegetable oil products	14.5	18	21.5	3.5
20.4	**Manufacture of Other Food and Kindred Products:** Includes assets used in the production of foods and beverages not included in classes 20.1, 20.2 and 20.3	9.5	12	14.5	5.5
20.5	**Manufacture of Food and Beverages-Special Handling Devices:** Includes assets defined as specialized materials handling devices such as returnable pallets, palletized containers, and fish processing equipment including boxes, baskets, carts, and flaking trays used in activities as defined in classes 20.1, 20.2, 20.3, 20.4. Does not include general purpose small tools such as wrenches and drills, both hand and power-driven, and other general purpose equipment such as conveyors, transfer equipment, and materials handling devices	3	4	5	20
21.0	**Manufacture of Tobacco and Tobacco Products:** Includes assets used in the production of cigarettes, cigars, smoking and chewing tobacco, snuff, and other tobacco products	12	15	18	5
22.1	**Manufacture of Knitted Goods:** Includes assets used in the production of knitted and netted fabrics and lace. Assets used in yarn preparation, bleaching, dyeing, printing, and other similar finishing processes, texturing, and packaging, are elsewhere classified	6	7.5	9	7
22.2	**Manufacture of Yarn, Thread, and Woven Fabric:** Includes assets used in the production of spun yarns including the preparing, blending, spinning, and twisting of fibers into yarns and threads, the preparation of yarns such as twisting, warping, and winding, the production of covered elastic yarn and thread, cordage, woven fabric, tire fabric, braided fabric, twisted jute for packing, mattresses, pads, sheets, and industrial belts, and the processing of textile mill waste to recover fibers, flocks, and shoddies. Assets used to manufacture carpets, man-made fibers, and nonwovens, and assets used in texturing, bleach-				

Asset guideline class	Description of assets included	Asset depreciation range (in years)			Annual asset guideline repair allowance percentage
		Lower limit	Asset guideline period	Upper limit	
	ing, dyeing, printing, and other similar finishing processes, are elsewhere classified	9	11	13	16
22.3	**Manufacture of Carpets, and Dyeing, Finishing, and Packaging of Textile Products:** Includes assets used in the production of carpets, rugs, mats, woven carpet backing, chenille, and other tufted products, and assets used in the joining together of backing with carpet yarn or fabric. Includes assets used in washing, scouring, bleaching, dyeing, printing, drying, and similar finishing processes applied to textile fabrics, yarns, threads, and other textile goods. Includes assets used in the production and packaging of textile products, other than apparel, by creasing, forming, trimming, cutting, and sewing, such as the preparation of carpet and fabric samples, or similar joining together processes (other than the production of scrim reinforced paper products and laminated paper products) such as the sewing and folding of hosiery and panty hose, the creasing, folding, trimming, and cutting of fabrics to produce nonwoven products, such as disposable diapers and sanitary products. Assets used in the manufacture of nonwoven carpet backing, and hard surface floor covering such as tile, rubber, and cork, are elsewhere classified	7	9	11	15
22.4	**Manufacture of Textured Yarns:** Includes assets used in the processing of yarns to impart bulk and/or stretch properties to the yarn. The principal machines involved are falsetwist, draw, beam-to-beam, and stuffer box texturing equipment and related high-speed twisters and winders. Assets, as described above, which are used to further process man-made fibers are elsewhere classified when located in the same plant in an integrated operation with man-made fiber producing assets. Assets used to manufacture man-made fibers and assets used in bleaching, dyeing, printing, and other similar finishing processes, are elsewhere classified	6.5	8	9.5	7
22.5	**Manufacture of Nonwoven Fabrics:** Includes assets used in the production of nonwoven fabrics, felt goods including felt hats, padding, batting, wadding, oakum, and fillings, from new materials and from textile mill waste. Nonwoven fabrics are defined as fabrics (other than reinforced and laminated composites consisting of nonwovens and other products) manufactured by bonding natural and/or synthetic fibers and/or filaments by means of induced mechanical interlocking, fluid entanglement, chemical adhesion, thermal or solvent reaction, or by combination thereof other than natural hydration bonding as occurs with natural cellulose fibers. Such means include resin bonding, web bonding, and melt bonding. Specifically includes assets used to make flocked and needle punched products other than carpets and rugs. Assets, as described above, which are used to manufacture nonwovens are elsewhere classified when located in the same plant in an integrated operation with man-made fiber producing assets. Assets used to manufacture man-made fibers and assets used in bleaching, dyeing, printing, and other similar finishing processes, are elsewhere classified	8	10	12	15
23.0	**Manufacture of Apparel and Other Finished Products:** Includes assets used in the production of clothing and fabricated textile products by the cutting and sewing of woven fabrics, other				

Asset guideline class	Description of assets included	Asset depreciation range (in years) Lower limit	Asset guideline period	Upper limit	Annual asset guideline repair allowance percentage
	textile products, and furs, but does not include assets used in the manufacture of apparel from rubber and leather	7	9	11	7
24.1	**Cutting of Timber:** Includes logging machinery and equipment and roadbuilding equipment used by logging and sawmill operators and pulp manufacturers for their own account	5	6	7	10
24.2	**Sawing of Dimensional Stock from Logs:** Includes machinery and equipment installed in permanent or well-established sawmills	8	10	12	6.5
24.3	**Sawing of Dimensional Stock from Logs:** Includes machinery and equipment installed in sawmills characterized by temporary foundations and a lack, or minimum amount, of lumber-handling, drying, and residue disposal equipment and facilities	5	6	7	10
24.4	**Manufacture of Wood Products, and Furniture:** Includes assets used in the production of plywood, hardboard, flooring, veneers, furniture, and other wood products, including the treatment of poles and timber	8	10	12	6.5
26.1	**Manufacture of Pulp and Paper:** Includes assets for pulp materials handling and storage, pulp mill processing, bleach processing, paper and paperboard manufacturing, and on-line finishing. Includes pollution control assets and all land improvements associated with the factory site or production process such as effluent ponds and canals, provided such improvements are depreciable but does not include buildings and structural components as defined in section 1.48-1(e)(1) of the regulations. Includes steam and chemical recovery boiler systems, with any rated capacity, used for the recovery and regeneration of chemicals used in manufacturing. Does not include assets used either in pulpwood logging, or in the manufacture of hardboard	10.5	13	15.5	10
26.2	**Manufacture of Converted Paper, Paperboard, and Pulp Products:** Includes assets used for modification, or remanufacture of paper and pulp into converted products, such as paper coated off the paper machine, paper bags, paper boxes, cartons and envelopes. Does not include assets used for manufacture of non-wovens that are elsewhere classified	8	10	12	15
27.0	**Printing, Publishing, and Allied Industries:** Includes assets used in printing by one or more processes, such as letterpress, lithography, gravure, or screen; the performance of services for the printing trade, such as book-binding, typesetting, engraving, photoengraving, and electrotyping; and the publication of newspapers, books, and periodicals	9	11	13	5.5
28.0	**Manufacture of Chemicals and Allied Products:** Includes assets used in the manufacture of basic chemicals such as acids, alkalies, salts, and organic and inorganic chemicals; chemical products to be used in further manufacture, such as synthetic fibers and plastics materials, including petrochemical processing beyond that which is ordinarily a part of petroleum refining; and finished chemical products, such as pharmaceuticals, cosmetics, soaps, fertilizers, paints and varnishes, explosives, and compressed and liquified gases. Does				

Asset guideline class	Description of assets included	Asset depreciation range (in years)			Annual asset guideline repair allowance percentage
		Lower limit.	Asset guideline period	Upper limit	
	not include assets used in the manufacture of finished rubber and plastic products or in the production of natural gas products, butane, propane, and byproducts of natural gas production plants	9	11	13	5.5
30.1	**Manufacture of Rubber Products:** Includes assets used for the production of products from natural, synthetic, or reclaimed rubber, gutta percha, balata, or gutta siak, such as tires, tubes, rubber footwear, mechanical rubber goods, heels and soles, flooring, and rubber sundries; and in the recapping, retreading, and rebuilding of tires	11	14	17	5
30.11	**Manufacture of Rubber Products—Special Tools and Devices:** Includes assets defined as special tools, such as jigs, dies, mandrels, molds, lasts, patterns, specialty containers, pallets. shells, and tire molds, and accessory parts such as rings and insert plates used in activities as defined in class 30.1. Does not include tire building drums and accessory parts and general purpose small tools such as wrenches and drills, both power and hand-driven, and other general purpose equipment such as conveyors and transfer equipment	3	4	5	
30.2	**Manufacture of Finished Plastic Products:** Includes assets used in the manufacture of plastics products and the molding of primary plastics for the trade. Does not include assets used in the manufacture of basic plastics materials nor the manufacture of phonograph records	9	11	13	5.5
30.21	**Manufacture of Finished Plastic Products—Special Tools:** Includes assets defined as special tools, such as jigs, dies, fixtures, molds, patterns, gauges, and specialty transfer and shipping devices, used in activities as defined in class 30.2. Special tools are specifically designed for the production or processing of particular parts and have no significant utilitarian value and cannot be adapted to further or different use after changes or improvements are made in the model design of the particular part produced by the special tools. Does not include general purpose small tools. such as wrenches and drills. both hand and power-driven, and other general purpose equipment such as conveyors, transfer equipment, and materials handling devices	3	3.5	4	5.5
31.0	**Manufacture of Leather and Leather Products:** Includes assets used in the tanning, currying, and finishing of hides and skins; the processing of fur pelts; and the manufacture of finished leather products, such as footwear, belting, apparel, and luggage	9	11	13	5.5
32.1	**Manufacture of Glass Products:** Includes assets used in the production of flat, blown, or pressed products of glass, such as float and window glass, glass containers, glassware and fiberglass. Does not include assets used in the manufacture of lenses	11	14	17	12
32.11	**Manufacture of Glass Products—Special Tools:** Includes assets defined as special tools such as molds, patterns, pallets, and specialty transfer and shipping devices such as steel racks to transport automotive glass, used in activities as defined in class 32.1. Special tools are specifically designed for the production or processing of particular parts and have no significant utilitarian value and cannot be adapted to further or different use after changes or improvements are				

Asset guideline class	Description of assets included	Asset depreciation range (in years)			Annual asset guideline repair allowance percentage
		Lower limit	Asset guideline period	Upper limit	
	made in the model design of the particular part produced by the special tools. Does not include general purpose small tools such as wrenches and drills, both hand and power-driven, and other general purpose equipment such as conveyors, transfer equipment, and materials handling devices	2	2.5	3	10
32.2	**Manufacture of Cement:** Includes assets used in the production of cement, but does not include any assets used in the manufacture of concrete and concrete products nor in any mining or extraction process	16	20	24	3
32.3	**Manufacture of Other Stone and Clay Products:** Includes assets used in the manufacture of products from materials in the form of clay and stone, such as brick, tile, and pipe; pottery and related products, such as vitreous-china, plumbing fixtures, earthenware and ceramic insulating materials; and also includes assets used in manufacture of concrete and concrete products. Does not include assets used in any mining or extraction processes	12	15	18	4.5
33.1	**Manufacture of Primary Ferrous Metals:** Includes assets used in the smelting and refining of ferrous metals from ore, pig, or scrap, the rolling, drawing, and alloying of ferrous metals; the manufacture of castings, forgings, and other basic products of ferrous metals; and the manufacture of nails, spikes, structural shapes, tubing, wire, and cable	14.5	18	21.5	8
33.11	**Manufacture of Primary Ferrous Metals—Special Tools:** Includes assets defined as special tools such as dies, jigs, molds, patterns, fixtures, gauges, and drawings concerning such special tools used in the activities as defined in class 33.1, manufacture of Primary Ferrous Metals. Special tools are specifically designed for the production or processing of particular products or parts and have no significant utilitarian value and cannot be adapted to further or different use after changes or improvements are made in the model design of the particular part produced by the special tools. Does not include general purpose small tools such as wrenches and drills, both hand and power-driven, and other general purpose equipment such as conveyors, transfer equipment, and materials handling devices. Rolls, mandrels, and refractories are not included in class 33.11 but are included in class 33.1	5	6.5	8	4
33.2	**Manufacture of Primary Nonferrous Metals:** Includes assets used in the smelting, refining, and electrolysis of nonferrous metals from ore, pig, or scrap, the rolling, drawing, and alloying of nonferrous metals; the manufacture of castings, forgings, and other basic products of nonferrous metals; and the manufacture of nails, spikes, structural shapes, tubing, wire, and cable	11	14	17	4.5
33.21	**Manufacture of Primary Nonferrous Metals—Special Tools:** Includes assets defined as special tools such as dies, jigs, molds, patterns, fixtures, gauges, and drawings concerning such special tools used in the activities as defined in class 33.2, Manufacture of Primary Nonferrous Metals. Special tools are specifically designed for the production or processing of particular products or parts and have no significant utilitarian value and cannot be adapted to further or different use after changes or improvements are made in the model design of the particu-				

Asset guideline class	Description of assets included	Asset depreciation range (in years)			Annual asset guideline repair allowance percentage
		Lower limit	Asset guideline period	Upper limit	
	lar part produced by the special tools. Does not include general purpose small tools such as wrenches and drills, both hand and power-driven, and other general purpose equipment such as conveyors, transfer equipment, and materials handling devices. Rolls, mandrels, and refractories are not included in class 33.21 but are included in class 33.2	5	6.5	8	4
34.0	**Manufacture of Fabricated Metal Products:** Includes assets used in the production of metal cans, tinware, nonelectric heating apparatus, fabricated structural metal products, metal stampings, and other ferrous and nonferrous metal and wire products not elsewhere classified	9.5	12	14.5	6
34.01	**Manufacture of Fabricated Metal Products—Special Tools:** Includes assets defined as special tools such as dies, jigs, molds, patterns, fixtures, gauges, and returnable containers and drawings concerning such special tools used in the activities as defined in class 34.0. Special tools are specifically designed for the production or processing of particular machine components, products, or parts, and have no significant utilitarian value and cannot be adapted to further or different use after changes or improvements are made in the model design of the particular part produced by the special tools. Does not include general purpose small tools such as wrenches and drills, both hand and power-driven, and other general purpose equipment such as conveyors, transfer equipment, and materials handling devices	2.5	3	3.5	3.5
35.1	**Manufacture of Metalworking Machinery:** Includes assets used in the production of metal cutting and forming machines, special dies, tools, jigs, and fixtures, and machine tool accessories	9.5	12	14.5	5.5
35.11	**Manufacture of Metalworking Machinery—Special Tools:** Includes assets defined as special tools, such as jigs, dies, fixtures, molds, patterns, gauges, and specialty transfer and shipping devices, used in activities as defined in class 35.1. Special tools are specifically designed for the production or processing of particular machine components and have no significant utilitarian value and cannot be adapted to further or different use after changes or improvements are made in the model design of the particular part produced by the special tools. Does not include general purpose small tools such as wrenches and drills, both hand and power-driven, and other general purpose equipment such as conveyors, transfer equipment, and materials handling devices	5	6	7	12.5
35.2	**Manufacture of Other Machines:** Includes assets used in the production of such machinery as engines and turbines; farm machinery, construction, and mining machinery; general and special industrial machines including office machines and nonelectronic computing equipment; miscellaneous machines except electrical equipment and transportation equipment	9.5	12	14.5	5.5
35.21	**Manufacture of Other Machines—Special Tools:** Includes assets defined as special tools, such as jigs, dies, fixtures, molds, patterns, gauges, and specialty transfer and shipping devices, used in activities as defined in class 35.2. Special tools are specifically designed for the production or processing of particular machine components and have no significant utilitarian value and cannot be adapted to further				

Asset guideline class	Description of assets included	Asset depreciation range (in years)			Annual asset guideline repair allowance percentage
		Lower limit	Asset guideline period	Upper limit	
	or different use after changes or improvements are made in the model design of the particular part produced by the special tools. Does not include general purpose small tools such as wrenches and drills, both hand and power-driven, and other general purpose equipment such as conveyors, transfer equipment, and materials handling devices	5	6.5	8	12.5
36.1	**Manufacture of Electrical Equipment:** Includes assets used in the production of machinery, apparatus, and supplies for the generation, storage, transmission, transformation, and utilization of electrical energy such as: electric test and distributing equipment, electrical industrial apparatus, household appliances, electric lighting and wiring equipment; electronic components and accessories, phonograph records, storage batteries and ignition systems	9.5	12	14.5	5.5
36.11	**Manufacture of Electrical Equipment—Special Tools:** Includes assets defined as special tools such as jigs, dies, molds, patterns, fixtures, gauges, returnable containers, and specialty transfer devices used in activities as defined in class 36.1. Special tools are specifically designed for the production or processing of particular machine components, products or parts, and have no significant utilitarian value and cannot be adapted to further or different use after changes or improvements are made in the model design of the particular part produced by the special tools. Does not include general purpose small tools such as wrenches and drills, both hand and power-driven, and other general purpose equipment such as conveyors, transfer equipment, and materials handling devices	4	5	6	
36.2	**Manufacture of Electronic Products:** Includes assets used in the production of electronic detection, guidance, control, radiation, computation, test, and navigation equipment or the components thereof including airborne application. Also includes assets used in the manufacture of electronic airborne communication equipment or the components thereof. Does not include the assets of manufacturers engaged only in the purchase and assembly of components	6.5	8.0	9.5	7.5
37.11	**Manufacture of Motor Vehicles:** Includes assets used in the manufacture and assembly of finished automobiles, trucks, trailers, motor homes, and buses. Does not include assets used in mining, printing and publishing, production of primary metals, electricity, or steam, or the manufacture of glass, industrial chemicals, batteries, or rubber products, which are classified elsewhere. Includes assets used in manufacturing activities elsewhere classified other than those excluded above, where such activities are incidental to and an integral part of the manufacture and assembly of finished motor vehicles such as the manufacture of parts and subassemblies of fabricated metal products, electrical equipment, textiles, plastics, leather, and foundry and forging operations. Does not include any assets not classified in manufacturing activity classes, e.g., does not include assets classified in asset guideline classes 00.11 through 00.4. Activities will be considered incidental to the manufacture and assembly of finished motor vehicles only if 75 percent or more of the value of the products produced under one roof are used for the manufacture and assembly of finished motor vehicles. Parts that are produced as a normal replacement stock complement in connection with the manufacture and as-				

Asset guideline class	Description of assets included	Asset depreciation range (in years)			Annual asset guideline repair allowance percentage
		Lower limit	Asset guideline period	Upper limit	
	sembly of finished motor vehicles are considered used for the manufacture and assembly of finished motor vehicles. Does not include assets used in the manufacture of component parts if these assets are used by taxpayer not engaged in the assembly of finished motor vehicles	9.5	12	14.5	9.5
37.12	**Manufacture of Motor Vehicles—Special Tools:** Includes assets defined as special tools, such as jigs, dies, fixtures, molds, patterns, gauges, and specialty transfer and shipping devices, owned by manufacturers of finished motor vehicles and used in qualified activities as defined in class 37.11. Special tools are specifically designed for the production or processing of particular motor vehicle components and have no significant utilitarian value, and cannot be adapted to further or different use, after changes or improvements are made in the model design of the particular part produced by the special tools. Does not include general purpose small tools such as wrenches and drills, both hand and power-driven, and other general purpose equipment such as conveyors, transfer equipment, and materials handling devices	2.5	3	3.5	12.5
37.2	**Manufacture of Aerospace Products:** Includes assets used in the manufacture and assembly of airborne vehicles and their component parts including hydraulic, pneumatic, electrical, and mechanical systems. Does not include assets used in the production of electronic airborne detection, guidance, control, radiation, computation, test, navigation, and communication equipment or the components thereof	8	10	12	7.5
37.31	**Ship and Boat Building Machinery and Equipment:** Includes assets used in the manufacture and repair of ships, boats, caissons, marine drilling rigs, and special fabrications not included in asset guideline classes 37.32 and 37.33. Specifically includes all manufacturing and repairing machinery and equipment, including machinery and equipment used in the operation of assets included in asset guideline class 37.32. Excludes buildings and their structural components	9.5	12	14.5	8.5
37.32	**Ship and Boat Building Dry Docks and Land Improvements:** Includes assets used in the manufacture and repair of ships, boats, caissons, marine drilling rigs, and special fabrications not included in asset guideline classes 37.31 and 37.33. Specifically includes floating and fixed dry docks, ship basins, graving docks, shipways, piers, and all other land improvements such as water, sewer, and electric systems. Excludes buildings and their structural components	13	16	19	2.5
37.33	**Ship and Boat Building—Special Tools:** Includes assets defined as special tools such as dies, jigs, molds, patterns, fixtures, gauges, and drawings concerning such special tools used in the activities defined in classes 37.31 and 37.32. Special tools are specifically designed for the production or processing of particular machine components, products, or parts, and have no significant utilitarian value and cannot be adapted to further or different use after changes or improvements are made in the model design of the particular part produced by the special tools. Does not include general purpose small tools such as wrenches and drills, both hand and power-driven, and other general purpose equipment such as conveyors, transfer equipment, and materials handling devices	5	6.5	8	0.5

Asset guideline class	Description of assets included	Asset depreciation range (in years)			Annual asset guideline repair allowance percentage
		Lower limit	Asset guideline period	Upper limit	
37.41	**Manufacture of Locomotives:** Includes assets used in building or rebuilding railroad locomotives (including mining and industrial locomotives). Does not include assets of railroad transportation companies or assets of companies which manufacture components of locomotives but do not manufacture finished locomotives	9	11.5	14	7.5
37.42	**Manufacture of Railroad Cars:** Includes assets used in building or rebuilding railroad freight or passenger cars (including rail transit cars). Does not include assets of railroad transportation companies or assets of companies which manufacture components of railroad cars but do not manufacture finished railroad cars	9.5	12	14.5	5.5
38.0	**Manufacture of Professional, Scientific, and Controlling Instruments:** Includes assets used in the manufacture of mechanical measuring, engineering, laboratory and scientific research instruments, optical instruments and lenses; surgical, medical, and dental instruments, equipment and supplies; ophthalmic goods, photographic equipment and supplies; and watches and clocks	9.5	12	14.5	5.5
39.0	**Manufacture of Athletic, Jewelry and Other Goods:** Includes assets used in the production of jewelry; musical instruments; toys and sporting goods; motion picture and television films and tapes; and pens, pencils, office and art supplies, brooms, brushes, caskets, etc.	9.5	12	14.5	5.5
	Railroad Transportation: Classes with the prefix 40 include the assets identified below that are used in the commercial and contract carrying of passengers and freight by rail. Assets of electrified railroads will be classified in a manner corresponding to that set forth below for railroads not independently operated as electric lines. Excludes the assets included in classes with the prefix beginning 00.1 and 00.2 above, and also excludes any nondepreciable assets included in Interstate Commerce Commission accounts enumerated for this class.				
40.1	**Railroad Machinery and Equipment:** Includes assets classified in the following Interstate Commerce Commission accounts: Roadway Accounts: (16) Station and office buildings (freight handling machinery and equipment only) (25) TOFC/COFC terminals (freight handling machinery and equipment only) (26) Communication systems (27) Signals and interlockers (37) Roadway machines (44) Shop machinery Equipment Accounts: (52) Locomotives (53) Freight train cars (54) Passenger train cars (57) Work equipment	11	14	17	10.5

Asset guideline class	Description of assets included	Asset depreciation range (in years) Lower limit	Asset guideline period	Upper limit	Annual asset guideline repair allowance percentage
40.2	**Railroad Structures and Similar Improvements:** Includes assets classified in the following Interstate Commerce Commission road accounts: (6) Bridges, trestles, and culverts (7) Elevated structures (13) Fences, snowsheds, and signs (16) Station and office buildings (stations and other operating structures only) (17) Roadway buildings (18) Water stations (19) Fuel stations (20) Shops and enginehouses (25) TOFC/COFC terminals (operating structures only) (31) Power transmission systems (35) Miscellaneous structures (39) Public improvements construction	24	30	36	5
40.3	**Railroad Wharves and Docks** Includes assets classified in the following Interstate Commerce accounts: (23) Wharves and docks (24) Coal and ore wharves	16	20	24	5.5
40.51	**Railroad Hydraulic Electric Generating Equipment**	40	50	60	1.5
40.52	**Railroad Nuclear Electric Generating Equipment**	16	20	24	3
40.53	**Railroad Steam Electric Generating Equipment**	22.5	28	33.5	2.5
40.54	**Railroad Steam, Compressed Air, and Other Power Plant Equipment**	22.5	28	33.5	7.5
41.0	**Motor Transport-Passengers:** Includes assets used in the urban and interurban commercial and contract carrying of passengers by road, except the transportation assets included in classes with the prefix 00.2	6.5	8	9.5	11.5
42.0	**Motor Transport-Freight:** Includes assets used in the commercial and contract carrying of freight by road, except the transportation assets included in classes with the prefix 00.2	6.5	8	9.5	11
44.0	**Water Transportation:** Includes assets used in the commercial and contract carrying of freight and passengers by water except the transportation assets included in classes with the prefix 00.2. Includes all related land improvements	16	20	24	8
45.0	**Air Transport:** Includes assets (except helicopters) used in commercial and contract carrying of passengers and freight by air. For purposes of section 1.167(a)-11(d)(2)(iv)(*a*) of the regulations, expenditures for "repair, maintenance, rehabilitation, or improvement" shall consist of direct maintenance expenses (irrespective of airworthiness provisions or charges) as defined by Civil Aeronautics Board uniform accounts 5200, maintenance burden (exclusive of expenses pertaining to maintenance buildings and improvements) as defined by Civil Aeronautics Board uniform accounts 5300, and expenditures which are not "excluded additions" as defined by section 1.167(a)-11(d)(2)(vi) of the regulations and which would be charged to property and equipment accounts in the Civil Aeronautics Board uniform system of accounts	9.5	12	14.5	15

Asset guideline class	Description of assets included	Asset depreciation range (in years)			Annual asset guideline repair allowance percentage
		Lower limit	Asset guideline period	Upper limit	
45.1	**Air Transport (restricted)** Includes each asset described in the description of class 45.0 which was held by the taxpayer on April 15, 1976, or is acquired by the taxpayer pursuant to a contract which was, on April 15, 1976, and at all times thereafter, binding on the taxpayer. This criterion of classification based on binding contract concept is to be applied in the same manner as under the general rules expressed in section 49(b)(1), (4), (5), and (8) of the Code	5	6	7	15
46.0	**Pipeline Transportation:** Includes assets used in the private, commercial, and contract carrying of petroleum, gas, and other products by means of pipes and conveyors. The trunk lines and related storage facilities of integrated petroleum and natural gas producers are included in this class. Excludes initial clearing and grading land improvements as specified in Rev. Rul. 72-403, 1972-2 C.B. 102, but includes all other related land improvements	17.5	22	26.5	3
	Telephone Communications: Includes the assets identified below and that are used in the provision of commercial and contract telephonic services such as:				
48.11	**Telephone Central Office Buildings:** Includes assets intended to house central office equipment, as defined in Federal Communications Commission Part 31 Account No. 212 whether section 1245 or section 1250 property	36	45	54	1.5
48.12	**Telephone Central Office Equipment:** Includes central office switching and related equipment as defined in Federal Communications Commission Part 31 Account No. 221	16	20	24	6
48.13	**Telephone Station Equipment:** Includes such station apparatus and connections as teletypewriters, telephones, booths, private exchanges, and comparable equipment as defined in Federal Communications Commission Part 31 Account Nos. 231, 232, and 234	8	10	12	10
48.14	**Telephone Distribution Plant:** Includes such assets as pole lines, cable, aerial wire, underground conduits, and comparable equipment, and related land improvements as defined in Federal Communications Commission Part 31 Account Nos. 241, 242.1, 242.2, 242.3, 242.4, 243, and 244	28	35	42	2
48.2	**Radio and Television Broadcastings:** Includes assets used in radio and television broadcasting, except transmitting towers	5	6	7	10
	Telegraph, Ocean Cable, and Satellite Communications (TOCSC) Includes communications-related assets used to provide domestic and international radio-telegraph, wire-telegraph, ocean-cable, and satellite communications services; also includes related land improvements.				
48.31	**TOCSC-Electric Power Generating and Distribution Systems:** Includes assets used in the provision of electric power by generation, modulation, rectification, channelization, control, and distribution. Does not include these assets when they are installed on customer's premises	15	19	23	

Asset guideline class	Description of assets included	Asset depreciation range (in years) Lower limit	Asset guideline period	Upper limit	Annual asset guideline repair allowance percentage
48.32	**TOCSC-High Frequency Radio and Microwave Systems:** Includes assets such as transmitters and receivers, antenna supporting structures, antennas, transmission lines from equipment to antenna, transmitter cooling systems, and control and amplification equipment. Does not include cable and long-line systems	10.5	13	15.5	
48.33	**TOCSC-Cable and Long-line Systems:** Includes assets such as transmission lines, pole lines, ocean cables, buried cable and conduit, repeaters, repeater stations, and other related assets. Does not include high frequency radio or microwave systems	21	26.5	32	
48.34	**TOCSC-Central Office Control Equipment:** Includes assets for general control, switching, and monitoring of communications signals including electromechanical switching and channeling apparatus, multiplexing equipment, patching and monitoring facilities, in-house cabling, teleprinter equipment, and associated site improvements	13	16.5	20	
48.35	**TOCSC-Computerized Switching, Channeling, and Associated Control Equipment:** Includes central office switching computers, interfacing computers, other associated specialized control equipment, and site improvements	8.5	10.5	12.5	
48.36	**TOCSC-Satellite Ground Segment Property:** Includes assets such as fixed earth station equipment, antennas, satellite communications equipment, and interface equipment used in satellite communications. Does not include general purpose equipment or equipment used in satellite space segment property	8	10	12	
48.37	**TOCSC-Satellite Space Segment Property:** Includes satellites and equipment used for telemetry, tracking, control, and monitoring when used in satellite communications	6.5	8	9.5	
48.38	**TOCSC-Equipment Installed on Customer's Premises:** Includes assets installed on customer's premises, such as computers, terminal equipment, power generation and distribution systems, private switching center, teleprinters, facsimile equipment, and other associated and related equipment	8	10	12	
48.39	**TOCSC-Support and Service Equipment:** Includes assets used to support but not engage in communications. Includes store, warehouse, and shop tools, and test and laboratory assets	11	13.5	16	
	Cable Television (CATV): Includes communications-related assets used to provide cable television (community antenna television services). Does not include assets used to provide subscribers with two-way communications services.				
48.41	**CATV-Headend:** Includes assets such as towers, antennas, preamplifiers, converters, modulation equipment, and program non-duplication systems. Does not include headend buildings and program origination assets	9	11	13	5
48.42	**CATV-Subscriber Connection and Distribution Systems:** Includes assets such as trunk and feeder cable, connecting hardware, amplifiers, power equipment, passive devices, directional taps, pedestals,				

Asset guideline class	Description of assets included	Asset depreciation range (in years)			Annual asset guideline repair allowance percentage
		Lower limit	Asset guideline period	Upper limit	
	pressure taps, drop cables, matching transformers, multiple set connector equipment, and converters	8	10	12	5
48.43	**CATV-Program Origination:** Includes assets such as cameras, film chains, video tape recorders, lighting, and remote location equipment excluding vehicles. Does not include buildings and their structural components	7	9	11	9
48.44	**CATV-Service and Test:** Includes assets such as oscilloscopes, field strength meters, spectrum analyzers, and cable testing equipment, but does not include vehicles	7	8.5	10	2.5
48.45	**CATV-Microwave Systems:** Includes assets such as towers, antennas, transmitting and receiving equipment, and broad band microwave assets if used in the provision of cable television services. Does not include assets used in the provision of common carrier services	7.5	9.5	11.5	2
	Electric, Gas, Water and Steam, Utility Services: Includes assets used in the production, transmission and distribution of electricity, gas, steam, or water for sale, including related land improvements.				
49.11	**Electric Utility Hydraulic Production Plant:** Includes assets used in the hydraulic power production of electricity for sale, including related land improvements, such as dams, flumes, canals, and waterways	40	50	60	1.5
49.12	**Electric Utility Nuclear Production Plant:** Includes assets used in the nuclear power production of electricity for sale and related land improvements. Does not include nuclear fuel assemblies	16	20	24	3
49.121	**Electric Utility Nuclear Fuel Assemblies:** Includes initial core and replacement core nuclear fuel assemblies (i.e. the composite of fabricated nuclear fuel and container) when used in a boiling water, pressurized water, or high temperature gas reactor used in the production of electricity. Does not include nuclear fuel assemblies used in breeder reactors	4	5	6	
49.13	**Electric Utility Steam Production Plant:** Includes assets used in the steam power production of electricity for sale, combustion turbines operated in a combined cycle with a conventional steam unit and related land improvements	22.5	28	33.5	5
49.14	**Electric Utility Transmission and Distribution Plant:** Includes assets used in the transmission and distribution of electricity for sale and related land improvements. Excludes initial clearing and grading land improvements as specified in Rev. Rul. 72-403, 1972-2 C.B. 102	24	30	36	4.5
49.15	**Electric Utility Combustion Turbine Production Plant:** Includes assets used in the production of electricity for sale by the use of such prime movers as jet engines, combustion turbines, diesel engines, gasoline engines, and other internal combustion engines, their associated power turbines and/or generators, and related land improvements. Does not include combustion turbines operated in a combined cycle with a conventional steam unit	16	20	24	4

Asset guideline class	Description of assets included	Asset depreciation range (in years)			Annual asset guideline repair allowance percentage
		Lower limit	Asset guideline period	Upper limit	
49.21	**Gas Utility Distribution Facilities:** Including gas water heaters and gas conversion equipment installed by utility on customers' premises on a rental basis	28	35	42	2
49.221	**Gas Utility Manufactured Gas Production Plants:** Includes assets used in the manufacture of gas having chemical and/or physical properties which do not permit complete interchangeability with domestic natural gas	24	30	36	2
49.222	**Gas Utility Substitute Natural Gas (SNG) Production Plant (naptha or lighter hydrocarbon feedstocks):** Includes assets used in the catalytic conversion of feedstocks of naphtha or lighter hydrocarbons to a gaseous fuel which is completely interchangeable with domestic natural gas	11	14	17	4.5
49.23	**Natural Gas Production Plant**	11	14	17	4.5
49.24	**Gas Utility Trunk Pipelines and Related Storage Facilities:** Excludes initial clearing and grading land improvements as specified in Rev. Rul. 72-403	17.5	22	26.5	3
49.25	**Liquefied Natural Gas Plant:** Includes assets used in the liquefaction, storage, and regasification of natural gas including loading and unloading connections, instrumentation equipment and controls, pumps, vaporizers and odorizers, tanks, and related land improvements. Also includes pipeline interconnections with gas transmission lines and distribution systems and marine terminal facilities	17.5	22	26.5	4.5
49.3	**Water Utilities:** Includes assets used in the gathering, treatment, and commercial distribution of water	40	50	60	1.5
49.4	**Central Steam Utility Production and Distribution:** Includes assets used in the production and distribution of steam for sale	22.5	28	33.5	2.5
50.0	**Wholesale and Retail Trade:** Includes assets used in carrying out the activities of purchasing, assembling, storing, sorting, grading, and selling of goods at both the wholesale and retail level. Also includes assets used in such activities as the operation of restaurants, cafes, coin-operated dispensing machines, and in brokerage of scrap metal	8	10	12	6.5
50.1	**Wholesale and Retail Trade Service Assets:** Includes assets such as glassware, silverware (including kitchen utensils), crockery (usually china) and linens (generally napkins, tablecloths and towels) used in qualified activities as defined in class 50.0	2	2.5	3	
70.2	**Personal and Professional Services:** Includes assets used in the provision of personal services such as those offered by hotels and motels, laundry and dry cleaning establishments, beauty and barber shops, photographic studios and mortuaries. Includes assets used in the provision of professional services such as those offered by doctors, dentists, lawyers, accountants, architects, engineers, and veterinarians. Includes assets used in the provision of repair and maintenance services and those assets used in providing fire and burglary protection services. Includes equipment or facilities used by cemetery organizations, news agencies, teletype wire services, frozen food lockers, and research laboratories	8	10	12	6.5

Asset guideline class	Description of assets included	Asset depreciation range (in years)			Annual asset guideline repair allowance percentage
		Lower limit	Asset guideline period	Upper limit	
70.21	**Personal and Professional Services Service Assets:** Includes assets such as glassware, silverware, crockery, and linens (generally sheets, pilowcases and bath towels) used in qualified activities as defined in class 70.2	2	2.5	3	
79.0	**Recreation:** Includes assets used in the provision of entertainment services on payment of a fee or admission charge, as in the operation of bowling alleys, billiard and pool establishments, theaters, concert halls, and miniature golf courses. Does not include amusement and theme parks and assets which consist primarily of specialized land improvements or structures, such as golf courses, sports stadia, race tracks, ski slopes, and buildings which house the assets used in entertainment services	8	10	12	6.5
80.0	**Theme and Amusement Parks:** Includes assets used in the provision of rides, attractions, and amusements in activities defined as theme and amusement parks, and includes appurtenances associated with a ride, attraction, amusement or theme setting within the park such as ticket booths, facades, shop interiors, and props, special purpose structures, and buildings other than warehouses, administration buildings, hotels, and motels. Includes all land improvements for or in support of park activities, (e.g. parking lots, sidewalks, waterways, bridges, fences, landscaping, etc.) and support functions (e.g. food and beverage retailing, souvenir vending and other nonlodging accommodations) if owned by the park and provided exclusively for the benefit of park patrons. Theme and amusement parks are defined as combinations of amusements, rides, and attractions which are permanently situated on park land and open to the public for the price of admission. This guideline class is a composite of all assets used in this industry except transportation equipment (general purpose trucks, cars, airplanes, etc., which are included in asset guideline classes with the prefix 00.2), assets used in the provision of administrative services (asset guideline classes with the prefix 00.1), and warehouses, administration buildings, hotels and motels	10	12.5	15	12.5

SEC. 4. EFFECT ON OTHER DOCUMENTS.

Rev. Procs. 72-10, 73-2, 73-3, 73-23, 73-24, 73-25, 73-26, 73-27, 73-28, 73-30, 74-27, 74-28, 74-29, 74-30, 74-31, 74-32, 74-37, 74-50, 76-16 76-17, 76-18, 76-27, 76-37, 77-2, 77-3 and 77-8 are superseded for property placed in service in taxable years ending on or after March 21, 1977, the date of publication of this Revenue Procedure in the Internal Revenue Bulletin, in accordance with section 1.167(a)-11(b)(4) of the regulations. However, the taxpayer may at his option apply Rev. Proc. 72-10, as previously modified by the aforementioned documents, without regard to this Revenue Procedure for such property placed in service in a taxable year beginning before March 21, 1977, and ending on or after that date. Such option shall be exercised in making the election to apply section 1.167(a)-11 for such year and may not be revoked after the latest time for making such election.

The asset guideline classes, asset guideline depreciation periods and ranges, and asset guideline repair allowance percentages set forth in this Revenue Procedure will from time to time be supplemented and revised as provided by section 1.167(a)-11(b)(4) of the regulations. Taxpayers using this Revenue Procedure should apply it as supplemented and revised.

News Release

Department of the Treasury
Internal Revenue Service
Washington, DC 20224 4/27/77
Tel. (202)566-4021

For Release: Immediate

IR-1803

Washington, D.C.--A new procedure affecting the classification, depreciation periods, and repair allowance percentages for substitute natural gas-coal gasification assets of taxpayers electing the Class Life Asset Depreciation Range System was today announced by the Internal Revenue Service.

The procedure supplements and modifies related material published in Revenue Procedure 77-10.

Revenue Procedure 77-14 is attached and will also appear in Internal Revenue Bulletin No. 1977-21, dated May 23, 1977.

PART III. ADMINSTRATIVE, PROCEDURAL, AND MISCELLANEOUS

26 CFR 601.105 Examination of returns and claims for refund, credit or abatement; determination of correct tax liability. (Also Part I, Section 167; 1.167(a)-11.)

REV. PROC. 77-14

SECTION 1. PURPOSE

The purpose of this Revenue Procedure is to prescribe under section 1.167(a)-11 of the Income Tax Regulations a new asset guideline class, asset depreciation period and range, and annual repair allowance percentage, designated class 49.223 Substitute Natural Gas - Coal Gasification.

SEC. 2. ASSET GUIDELINE CLASSES, PERIODS, ASSET DEPRECIATION RANGES, AND ANNUAL REPAIR ALLOWANCE PERCENTAGES FOR THE GAS INDUSTRY ACTIVITIES ENUMERATED BELOW.

The asset guideline classes and asset guideline depreciation periods, ranges, and annual repair allowance percentages for the following gas industry activities are established as set forth below.

Asset Guideline Class	Description of Assets Included	Asset Depreciation Range (In years) Lower Limit	Asset Guideline Period	Asset Depreciation Range (In years) Upper Limit	Annual Asset Guideline Repair Allowance Percentage
49.223	Substitute natural gas-coal gasification Includes assets used in the manufacture and production of pipeline quality gas from coal using the basic Lurgi process with advanced methanation. Includes all process plant equipment and structures used in this coal gasification process and all utility assets such as cooling systems, water supply and treatment facilities, and assets used in the production and distribution of electricity and steam for use by the taxpayer in a gasification plant and attendant coal mining site processes but not for assets used in the production and distribution of electricity and steam for sale to others. Also includes all other related land improvements.				

Asset Guideline Class	Description of Assets Included	Asset Depreciation Range (In years) Lower Limit	Asset Guideline Period	Asset Depreciation Range (In years) Upper Limit	Annual Asset Guideline Repair Allowance Percentage
	Does not include assets used in the direct mining and treatment of coal prior to the gasification process itself.	14.5	18	21.5	15.0

SEC. 3. EFFECT ON OTHER DOCUMENTS.

Rev. Proc. 77-10, 1977-12 I.R.B. 4, is modified by adding the guideline class set forth in section 2 above.

SEC. 4. EFFECTIVE DATE.

The asset guideline class, period, asset depreciation range, and annual repair allowance percentage for gas industry activities set forth in this Revenue Procedure are effective for property placed in service in taxable years beginning after December 31, 1976.

X X X

NOTE: This Appendix contains the most recent version of IRS Revenue Procedure 77-10. The IRS updates this publication periodically. Any source calculating a noncompliance penalty should make certain that it obtains the most recent revisions to this Revenue Procedure from the Department of the Treasury.

Attachment V

WORKSHEETS

This attachment contains worksheets which can be used to calculate input data. Each worksheet will also contain reminders for points which may be overlooked in calculations.

WORKSHEET A

Calculation Of The Capital Expenditure Input

1. List price or estimated price of the equipment = $
2. Less: Discount from manufacturer = _____
3. Equals net price of equipment =
4. Plus: Sales tax on equipment[1] =
5. Plus: Freight and delivery charge = _____
6. Equals estimated cost of equipment delivered =
7. Plus: Installation charge =
8. Plus: Value of lost production =
9. Plus: Cost of building construction or modifications = _____
10. Equals Total Capital Expenditure = $_____

Note: Line 6 divided by line 10 is the percentage of qualified investment for calculation of the investment tax credit.

QUALIFIED PERCENTAGE INVESTMENT TAX CREDIT

$\frac{\text{Line 6}}{\text{Line 10}}$ = _____ X 10 = _____%

If the depreciable life of the equipment is less than 7 years, this figure must be adjusted as described on page II-16.

[1] Some corporations subtract sales tax from revenue in the year of purchase. If this is the case, the sales tax is multiplied by (1 - Tax Rate) and subtracted from the cost of the equipment rather than added as in step four.

WORKSHEET B

Operating And Maintenance Expense

1. Annual Labor Expense

   _____ Hours X $_____ per hour = _____
2. Power Cost

   _____ Kwh X $_____ per Kwh = _____
3. Water Cost

   _____ Gallons X $_____ per gallon = _____
4. Raw Materials and Supplies

   _____ lbs X $_____ per lbs = _____
5. Yearly increase in property tax = _____
6. Cost of production lost due to maintenance or use of equipment = _____
7. Total Cost (1 + 2 + 3 + 4 + 5 + 6) = _____
8. Less: Value of by-products

   _____ lbs at $_____ per lbs = _____
9. Annual Operating and Maintenance (7-8) $_____

Note: Line 9 divided by 12 is the maximum amount of any monthly pre-compliance expenditure.

$\frac{\text{Line 9}}{12}$ = $_____ Maximum amount which may be entered as a pre-compliance monthly operating and maintenance expense.

WORKSHEET C

Calculation Of Income Tax Rate

1. Marginal Federal tax rate. _____
2. Marginal State tax rate. _____
3. Marginal Local tax rate. _____

Calculation of Adjusted Local Tax.

(1 - State Tax Rate) x Local Tax Rate
= (1 - _____) x _____
= _____ x _____
= _____ = Adjusted Local Tax Rate.

Calculation of Adjusted State and Local Tax.

(1 - Federal Tax Rate) x (State Tax Rate + Adjusted Local Rate)
= (1 - _____) x (_____ + _____)
= _____ x _____
= _____ = Adjusted Local and State Tax.

Calculation of Tax Rate.

100 x (Federal Tax Rate + Adjusted Local and State Tax)
= 100 x (_____ + _____)
= 100 x _____
= _____ = Tax Rate.

Section III

USING THE COMPUTER PROGRAM

Gaining Access To The System

The computer program used to calculate the non-compliance penalty is written in the language FORTRAN. It is designed to operate on a time sharing computer. The method used to access, or load, the program on a particular computer system will vary slightly from that on any other system. The following description of the accessing procedure applies to EPA's Washington Computer Center. The procedure at other installations will be somewhat different.

1. Switch on the terminal. The on/off switch is usually located on the keyboard, but some models have switches on the top or back of the terminal.

2. Contact the computer system. This usually involves dialing the computer's number on a telephone and then connecting the telephone to a coupler. When a connect signal is obtained, push the Return key once more. The computer will then respond with an indication that contact is established.

3. Account and code number. At this time, the computer will ask for a user number, a password and an account number. This number is specific to the computer system and must be known beforehand. These are entered by typing on the keyboard and pressing the "return" key.

4. Running the program. The command
EXEC PENALTY:EPABOH,GREGION=200K
will start the program.

   Additional questions will follow each data input (and "return"). Caution: When user demand is high, response time can be very slow. Be certain the computer has given you your complete prompt before answering input questions. A prompt is generally a two digit alpha-numeric job identifier and a question mark (e.g., 2B?)

Exhibit III - 1 illustrates the procedure used to access the computer.

Exhibit III-1

ACCESSING THE COMPUTER

```
ALPHA
READY 1. ACC

ALPHA System at CO.MAT

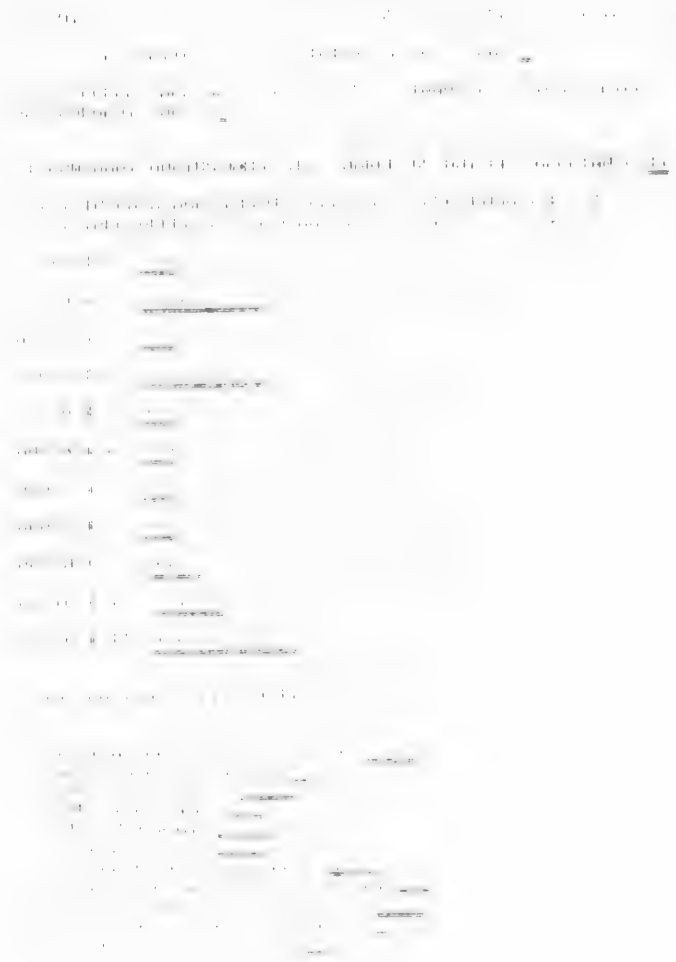
PLEASE ENTER: userid,password,account,term id
EPAAWS,[redacted]
EPAAWS/PHIC on line 23 at 17:49:1., 03/05/79
03/05/79: LAST CALL FOR RADPI PROJ MGMT COURSE.
          AWS DOCUMENTATION AVAILABLE FOR ORDERING
          120. BPS MODEMS CANCELLED
CL.SLIB.EPAAWS: Space for 835 lines
?EXEC NCPP:EPABOH
199: 12 SUBMITTED
?
```

Entering The Data

It is important in using a computer to understand that the computer requires a specific form of data entry. For example, if the item in question has the value of ten percent and the computer program is designed to accept a figure expressed in percentage terms, only the entry 10 is acceptable. Entries such as 10%, TEN, and .10 are all incorrect. The first two will result in an error message being typed at the terminal, followed by a command to re-enter the data. The third entry will be interpreted by the computer as 0.10 percent and used in the computation as that value. The result will be an incorrect figure for that penalty. If a wrong number is entered and the Return key has not been pushed, the mistake can be corrected by detecting the error and re-entering the number. To delete a number before the Return key is pushed, simply backspace the typing element (by pushing the Control and H keys simultaneously). If during data entry a wrong number is entered and the Return key is pushed, operation of the program can be halted by pushing the Break key. The computer will respond by printing OPTION?. To stop the program, type CANCEL. However, in most cases it will be more convenient to continue entering data, allow the computations to be made, and then change the erroneous value.

The following paragraphs discuss general rules to be followed in entering data into the computer program. Exhibit III - 2 contains an example of the completed entry for the Fertilizer Company. Figures which are underlined have been entered by the program user. After each line is entered the carriage return should be pressed. It should also be noted that each question asked by the computer must be answered. Thus, for example, if a firm has no debt and the interest rate is inapplicable, a zero must be entered for the interest rate. Certain questions asked by the computer refer to special types of analysis such as post-compliance settlements, limited life facilities and industrial development bonds. These special cases are discussed in a later chapter.

Exhibit II-2
ENTERING DATA



- Post-Compliance Settlement. This number is entered only as a 0 or 1. For the Fertilizer Company this is an initial calculation and a 0 is entered.

- Limited Life Facility. This number is entered as 0 or 1. For the Fertilizer Company this is not a limited life facility and a 0 is entered.

- Percent Financed by Industrial Development Bonds. This is entered as a percent. For the Fertilizer Company, a 0 is entered.

- Number of Months out of Compliance. This number is entered only as an integer. Fractions or decimals are not allowed. For the Fertilizer Company, compliance will be achieved in eleven months. This is entered as 11.

- Schedule of Capital Investments and Pre-Compliance Operating and Maintenance Expense. The program will ask for an estimate of such expenditures for each month which the firm will be out of compliance. If the firm will not make a pre-compliance capital expenditure in a particular month, a zero is entered. If no pre-compliance expenditures are to be made, the entire capital expenditure is entered in the last month.

  For the Fertilizer Company, capital expenditures of $166,666.67 will be made in the second, fourth, and eleventh months. All other months will be entered as 0.

  After entering the capital expenditure in each month, the user types a comma and then enters the operating and maintenance expense in each month. These are expenses to be incurred during the period of noncompliance on a month-by-month basis. If in any month a pre-compliance operating and maintenance expense is not incurred, a zero must be entered.

For the Fertilizer Company, pre-compliance operating and maintenance expenses will not be incurred in the first eight months. In the ninth month, the estimated expense is $100. In the tenth month it is $1,050. In the eleventh month it is $740. These are entered without dollar signs.

- Initial Annual OM Expense. The initial annual operating and maintenance expense is the expense which would be incurred if the equipment were installed and operating. The program is designed to reject monthly pre-compliance expenditures larger than one-twelfth of the annual operating and maintenance expense. For the Fertilizer Company, operating and maintenance expenses are $15,000.

- Investment Tax Rate. This is entered as a percent and not as a decimal. Thus, for example, 7.5 percent would be entered as 7.5. The program is designed to test for data entered as a decimal and print an error message. In the Fertilizer Company example, the investment tax rate was 10 percent.

- Income Tax Rate. This is also entered as a percent. For the Fertilizer Company the tax rate is 49.73 percent.

- Inflation Rate. The inflation rate is entered as 8.3 percent.

- Discount Rate. This is entered as a percent. The lower bound for any discount rate used is the rate of inflation. The program will not accept discount rates lower than the rate of inflation and will print an error message.

  For the Fertilizer Company, the discount rate is the twenty quarter average after tax return on equity for the chemicals and allied products industry. This is calculated to be 15.84 percent.

- Interest Rate. The interest rate is entered as a percent. For the Fertilizer Company this is the average return on "A" rated industrial bonds. The latest reported average is 8.76 percent.

- Preferred Dividend Rates. This is entered as a percent. If the firm does not have preferred stock, both the dividend rate and the preferred share of the investment are entered as zero. For the Fertilizer Company this was the latest monthly average yield on "a" rated utility preferred stocks. It is entered as 8.88 percent.

- Preferred Share of Investment. The preferred share of the investment is entered as a percent. For the Fertilizer Company this was computed at 3.5 percent.

- Equity Share of Investment. This is entered as a percent. It was computed to be 67.5 percent for the Fertilizer Company. If the sum of the preferred share of the investment and the equity share of the investment is greater than 100 percent, an error message is printed.

- Depreciation Life in Years. This number must be entered as an integer. Decimals or fractions cannot be used. For the Fertilizer Company the depreciation life was nine years.

- Useful Life in Years. The useful life in years must also be entered as an integer. For the Fertilizer Company, the useful life is eleven years.

Error Messages For Data Entry

The program for computing the noncompliance penalty was designed to test for errors in the data as it is entered into the computer. If the program detects an error, a message is printed informing the user and requesting that the mistake be corrected. Examples of such error messages follow.

1. Pre-Compliance Expenditure. As discussed in Section II, it is not possible to enter a pre-compliance monthly operating and maintenance expenditure which is larger than one-twelfth of the annual operating and maintenance expense. Exhibit III-3 shows an annual operating and maintenance expense of $15,000. The error message is printed because the user entered $2,000 for a pre-compliance expenditure.

Exhibit III-3

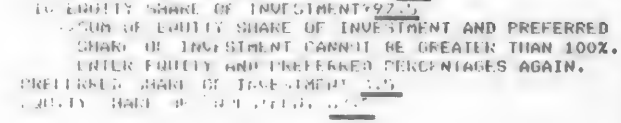
ERROR IN ENTERING PRE-COMPLIANCE O&M EXPENDITURES

MONTH # 1 ?0.0
MONTH # 2 ?0.0
MONTH # 3 ?0.0
MONTH # 4 ?0.0
MONTH # 5 ?0.0
MONTH # 6 ?0.0
MONTH # 7 ?0.0
MONTH # 8 ?0.0
MONTH # 9 ?0.0
MONTH # 10 ?0.0
MONTH # 11 ?0.0
MONTH # 12 ?0.0
TOTAL CAPITAL EXPENDITURES ?0.0
TOTAL ANNUAL OPERATING EXPENSE ?0.0

2. Equity and Preferred Share. The program will print an error message if the sum of the equity share of the investment and the preferred share of the investment are greater than 100 percent. This is illustrated in Exhibit III-4.

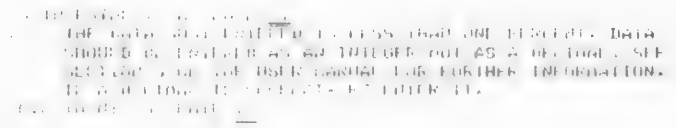
Exhibit III-4

EQUITY AND PREFERRED SHARE OF INVESTMENT GREATER THAN 100 PERCENT


PERCENT OF INVESTMENT?35
EQUITY SHARE OF INVESTMENT?97
SUM OF EQUITY SHARE OF INVESTMENT AND PREFERRED SHARE OF INVESTMENT CANNOT BE GREATER THAN 100%.
ENTER EQUITY AND PREFERRED PERCENTAGES AGAIN.
PREFERRED SHARE OF INVESTMENT ?5
EQUITY SHARE OF INVESTMENT ?95

3. Entering Data As a Decimal. An error message will be printed if the investment tax rate is entered as a decimal. This is illustrated in Exhibit III-5.

Exhibit III-5
DATA ENTERED AS A DECIMAL AND THE CORRECTION



4. Inflation Rate Higher Than Discount Rate. The program will print an error message if the inflation rate is higher than the discount rate. For this type of error the program allows the user to continue to enter data. At the end of data entry an error message is printed and the user can change either the inflation rate or the discount rate. This is illustrated in Exhibit III-6 where the discount rate of 15.84 percent was erroneously entered as 5.84 percent.

Exhibit III-6
ENTERING INFLATION RATE
THAT IS HIGHER THAN DISCOUNT RATE

Output From The Program

The output from the computer program will also require several responses from the user. In general, the output is structured in the following way.

- The amortization and depreciation method used in calculating the penalty is printed. For example, for the Fertilizer Company, rapid amortization and straight line depreciation are used.
- The program asks the user how many months will elapse between the first day of violation and the date of the first penalty payment.
- The program prints the quarterly penalty payments the firm must make during the period of noncompliance.
- The option to compute a lump sum settlement is offered. The user can specify the date for that payment.
- The program asks if changes to the input data are desired.

An example of the output for the Fertilizer Company appears in Exhibit III-7. Once again, the presence of underlining indicates data entered by the user.

Exhibit III-7

CALCULATION OF NONCOMPLIANCE PENALTY

```
RAPID AMORTIZATION STRAIGHT LINE DEPRECIATION

HOW MANY MONTHS AFTER THE FIRST DAY OF NONCOMPLIANCE
    WILL THE FIRST PENALTY PAYMENT BE MADE?0

QUARTERLY PENALTY PAYMENT DUE AT BEGINNING OF MONTH

     MONTH          PENALTY
       1          $  5013.86
       4          $  5318.85
       7          $  5425.92
      10          $  5535.17

DO YOU WANT TO SEE A LUMP SUM SETTLEMENT (1=YES,0=NO)?1

* * * LUMP SUM SETTLEMENT * * *

HOW MANY MONTHS AFTER THE FIRST DAY OF NONCOMPLIANCE
    WILL THE LUMP SUM SETTLEMENT BE MADE?0

LUMP SUM SETTLEMENT AT END OF MONTH  0 = $ 20339.25


* * * NEW COMPUTATION * * *

HOW MANY CHANGES TO THE INPUT DATA (0=EXIT FROM PROGRAM)?0

 .END.  NORMAL EXIT FROM PROG.

(RUN)       83.56
Exit
Log
```

The output printed in Exhibit III-6 illustrates only a few of the possible variations in penalty calculation possible with the computer program. The remainder of this section discusses in detail the output from the Fertilizer Company example and the program options available to alter that output.

1. Amortization and Depreciation Method. The computer program calculates the capital investment portion of the penalty using standard and rapid amortization. Under both types of amortization the program calculates the depreciation tax savings using straight line, sum-of-the-years-digits and double-declining balance depreciation methods. The formulae for these calculations are contained in the Technical Support Document. The program automatically chooses the method which will result in the lowest penalty. This method is then used to calculate the penalty shown.

2. Delay in the Penalty. The program asks the user how many months the first penalty payment will be delayed. The months of delay are calculated from the day a notice of noncompliance is issued until the first payment is made. Exhibit III-7 illustrated the payment made if the firm paid the first quarterly penalty on

the day that the notice of noncompliance was issued. The first quarterly payment was $5,213.86. The second payment would be made ninety days later and it would equal the penalty shown for month number four ($5,318.83).

A more realistic example might involve a six-month delay in the first payment. In this case, the output would appear as in Exhibit III-8. The first penalty payment includes the amount that should have been paid at the beginning of the first month, plus the penalties that should have been paid at the beginning of the fourth and seventh months. Because of the six-month grace period, no interest is charged for this period of delay. The next quarterly penalty payment is due three months later, putting the firm back on the original penalty schedule.

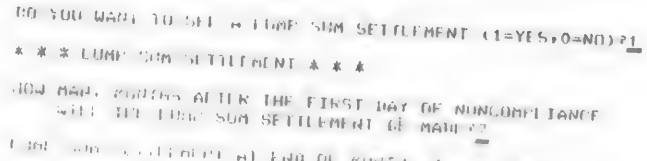
Exhibit III-8

SIX MONTH DELAY IN PAYMENT OF PENALTY

3. Lump Sum Settlement. A lump sum settlement is sometimes made instead of quarterly payments. For example, if the firm was going to be out of compliance for four quarters, it could either pay the four quarterly payments shown in the output or pay the lump sum settlement. In terms of present value, the amount eventually paid is the same in each case. The six-month grace period for delay in payment also applies to the lump sum settlement.

If the firm wishes to pay a lump sum settlement but will delay payment, the number of months of delay must be entered. Exhibit III-9 illustrates a seven month delay for the Fertilizer Company.

Exhibit III-9
SEVEN MONTH DELAY IN PAYMENT
OF LUMP SUM SETTLEMENT


DO YOU WANT TO SET A LUMP SUM SETTLEMENT (1=YES,0=NO)?1
* * * LUMP SUM SETTLEMENT * * *
HOW MANY MONTHS AFTER THE FIRST DAY OF NONCOMPLIANCE
WILL THE LUMP SUM SETTLEMENT BE MADE?2
LUMP SUM SETTLEMENT AT END OF MONTH 2 = $ 20590.01

Thus, for the Fertilizer Company, delaying the lump sum settlement seven months increased the settlement to $20,590.01 from the $20,339.25 shown in Exhibit III-7. The $250.76 difference between the lump sum settlement delayed seven months and the settlement paid on the date of noncompliance is equal to one month's interest on $20,339.25.[1]

The use of the lump sum settlement is required if the first penalty payment is delayed longer than the firm is out of compliance. In this event, the firm will not make quarterly payments but will make one lump sum settlement. Exhibit III-10 shows the output from the program if a twelve-month delay in penalty payment occurs. The Fertilizer Company was out of compliance eleven months.

5. New Computation. The user has several options here. By typing in 0 (zero) and pushing the carriage return, the program can be terminated. Typing 999 will result in all of the data that is currently in the program being printed; the program will then once again ask if any changes are to be made. An example of typing 999 is shown in Exhibit III-11.

[1] The lump sum settlement was paid after a seven month delay. However, the six-month grace period eliminates the interest charge for all months except one.

Exhibit III-10

PENALTY PAYMENT WHEN DELAY
IS LONGER THAN NONCOMPLIANCE PERIOD

Exhibit III-11

PRINTING DATA THAT HAS BEEN ENTERED IN PROGRAM

If changes are desired in the input, the following steps must be taken.

- The number of changes desired must be entered.
- For each change, the computer will respond with a question mark. When the question mark is printed, type in the number of the item that you wish to change. (For example, 4 for the marginal income tax rate).
- The computer will print the name of the item. Enter the new data desired and push the carriage return.

The following is an example using the Fertilizer Company. Suppose that the interest rate, which has been entered as 8.76 percent, should be 9.76 percent and that the preferred share of the investment, which was entered as 3.5 percent, should be 10 percent.[1] Two changes are thus necessary.

[1] The equity share will remain at 67.5 percent. The program sums the equity and preferred shares and calculates automatically the debt share. Thus, the increase in preferred share from 3.5 to 10 percent while the equity share is held constant, will result in a decrease in debt share.

Exhibit III-11
ALTERING DATA IN THE PROGRAM

```
* * * NEW COMPUTATION * * *

HOW MANY CHANGES TO THE INPUT DATA (0=EXIT FROM PROGRAM)?2
SPECIFY WHAT YOU WANT TO CHANGE BY ITEM NUMBER.
     PRESS THE RETURN KEY AFTER EACH REQUEST.
?7
INTEREST RATE?9.76
?9
PREFERRED SHARE OF INVESTMENT?10
```

When the return key is pressed after entering the 10, the computation will be made using these new values. It should be noted that these new values permanently replace the previous values in the program.

SECTION IV

CALCULATION OF THE POST-COMPLIANCE SETTLEMENT

The post-compliance settlement adjusts the penalty payment to reflect the firm's actual capital and operating expenditures rather than the estimates used in the original penalty calculation. For this purpose, six types of data are needed:

- A schedule of actual capital expenditures made by the firm in reaching compliance.
- A schedule of actual operating and maintenance expenditures made by the firm prior to compliance.
- A new estimate of post-compliance annual operating and maintenance expense based on the firm's experience prior to the post-compliance settlement.
- The number of months between the day of compliance and date of post-compliance settlement.
- A post-compliance settlement interest rate chosen by the Department of the Treasury.
- A listing of the actual penalty payments made by the firm and the months in which they were made.

In addition to these new data, it will be necessary to have available the financial parameters originally used to calculate the noncompliance penalty for the firm. To continue the example of the hypothetical Fertilizer Company, Exhibit IV-1 contains the data originally used to calculate the noncompliance penalty.

Exhibit IV-1

FERTILIZER COMPANY
July 1979

DATA USED FOR ORIGINAL NONCOMPLIANCE PENALTY CALCULATIONS[1]

* * * DATA REQUIRED FOR POST-COMPLIANCE SETTLEMENT * * *

INVESTMENT TAX RATE= 10
INCOME TAX RATE = 49.23
INFLATION RATE = 8.3
DISCOUNT RATE = 15.84
INTEREST RATE = 8.76
PREFERRED DIVIDEND RATE= 8.88
PREFERRED SHARE OF INVESTMENT = 3.5
EQUITY SHARE OF INVESTMENT= 67.5
DEPRECIATION LIFE IN YEARS = 9
USEFUL LIFE IN YEARS = 11

[1] Listed during original penalty calculation by typing 999 when changes in input data were requested.

Preparing New Data For Entry Into The Program

In order to calculate the post-compliance settlement, the computer program should be accessed in the manner described on pages III-1 to III-3. After the RUN command has been typed, the terminal will ask if the penalty calculation is for a post-compliance settlement. This is illustrated in Exhibit IV-2.

Exhibit IV-2
CALCULATING A POST-COMPLIANCE SETTLEMENT

```
03/02/79        EPA NON-COMPLIANCE PENALTY PROGRAM  VERSION 1.0     12:01

IS THIS A POST-COMPLIANCE SETTLEMENT CALCULATION (1=YES,0=NO)?1
```

The computer program will then ask for data on the actual penalty payments made by the firm and the month in which each payment was made. The data are entered in the following order.

1. Number of penalty payments made by the firm. This is the actual number of payments made by the firm. If more than one payment is made in a month, they should be totalled and counted as one payment.

2. Month of the penalty payment. This is the number of the month in which the penalty payment is received by EPA, beginning with the month the firm is out of compliance. For example, a firm making a payment at the time notice of noncompliance is issued would enter a one. If a six-month delay in payment occurred, a seven would be entered.

3. Actual penalty payment. This is the dollar amount of the penalty actually received from the firm in each month. The payment entered should not include the 20 percent penalty for late payment. The data entered in the Fertilizer Company example is shown in Exhibit IV-3. As can be seen in the exhibit, these payments are identical to the penalties calculated in the last section and shown in Exhibit III-7.

Exhibit IV-3
ENTRY OF DATA ON ACTUAL PENALTY PAYMENTS

ENTER NUMBER OF PENALTY PAYMENTS MADE BY FIRM?4

ENTER FIRST MONTH OF PAYMENT, THEN DOLLAR AMOUNT
PAYMENT MONTH?1
PAYMENT AMOUNT?5213.86

PAYMENT MONTH?4
PAYMENT AMOUNT?5418.83

PAYMENT MONTH?7
PAYMENT AMOUNT?5475.92

PAYMENT MONTH?10
PAYMENT AMOUNT?5535.17

The terminal now asks for data on the Treasury interest rate, months out of compliance, limited life facilities, and financing with industrial development bonds. These data are entered in the following order.

1. Treasury interest rate. This is an annual interest rate set by the Secretary of the Treasury for the post-compliance settlement. It is entered as a percent. For the Fertilizer Company, the rate was chosen as 15.84 percent, which is the firm's return on equity.

2. Months out of compliance. This is the actual number of months the firm was out of compliance beginning on the date notice of noncompliance was issued and continuing until the firm demonstrates compliance was achieved.

3. Limited life facility. The limited life facility requires a slightly different method of calculation for the post-compliance settlement. This method is discussed in detail in the next section. For the Fertilizer Company, a zero is entered.

4. Industrial Development Bonds. This is an option explained in detail in the next section. For the Fertilizer Company, industrial development bonds were not sold. A zero is entered at the terminal. All four of the above data entries are shown in Exhibit IV-4.

Exhibit IV-4
ADDITIONAL QUESTIONS ASKED BY TERMINAL
DURING POST-COMPLIANCE SETTLEMENT CALCULATION

TREASURY INTEREST RATE?15.84
IS THIS A LIMITED LIFE FACILITY (1=YES,0=NO)?0

ENTER PERCENTAGE OF TOTAL PROJECT FINANCED BY INDUSTRIAL DEVELOPMENT BONDS?0

HOW MANY MONTHS WAS THE SOURCE OUT OF COMPLIANCE?11

The computer program now requests data on the actual expenditures the firm made in order to reach compliance. These new data are entered in the following order.

1. Schedule of Actual Capital Expenditures. These are the payments the firm made, or capital costs the firm incurred, in each month during the period of noncompliance. They are entered in actual dollars as of the period the expenditure was made. No adjustment for inflation during the period of noncompliance should be made, since the program will automatically convert the actual dollars to real dollars as of the first day of noncompliance.

The sources for data on the actual monthly expenditures for noncompliance include cancelled checks to manufacturers and shippers, accounting entries in the firm's fixed asset accounts, or manufacturers invoices. The Fertilizer Company submitted the data in Exhibit IV-5 to show capital expenditures made during the period of noncompliance.

2. Schedule of Actual Operating and Maintenance Expense. This schedule indicates the actual pre-compliance expenditures made by the firm in each month. This data will be calculated by the firm from accounting information and will include labor, utilities, supplies, property taxes and the value of any by-

Exhibit IV-5

FERTILIZER COMPANY
CALCULATION OF ACTUAL CAPITAL EXPENDITURE

1.	List price or estimated price of the equipment =	$536,588.92
2.	Less: Discount from manufacturer =	(10,731.78)
3.	Equals net price of equipment =	525,857.14
4.	Plus: Sales tax on equipment[1] =	26,292.86
5.	Plus: Freight and delivery charge =	0
6.	Equals estimated cost of equipment delivered =	$552,150.00
7.	Plus: Installation charge =	0
8.	Plus: Value of lost production =	0
9.	Plus: Cost of building construction or modifications =	0
10.	Equals Total Capital Expenditure =	$552,150.00

The capital expenditures were made in three equal payments of $184,050.00 starting in the ninth month of noncompliance.

[1] Sales tax in this case was not subtracted from revenue in the year of purchase.

products. The Fertilizer Company submitted the data in Exhibit IV-6 for pre-compliance expenditures. These values are adjusted for inflation by the program.

The program is designed to print an error message if any monthly precompliance operating and maintenance expenditure is larger than one-twelfth of the new post-compliance operating and maintenance cost.[1] When this occurs, it is likely that equipment start up costs which should have been included in capital expenditures have been incorrectly charged to precompliance operating and maintenance expense. In such a case, precompliance capital expenditures and operating and maintenance expenses should be adjusted accordingly.

3. Estimate of Annual Operating and Maintenance Expenditures. Because the post-compliance settlement will occur before the new equipment has operated for a full year, it will be necessary to estimate post-compliance annual operating and maintenance expenses based on the firm's experience from compliance to the time of the post-compliance settlement. These estimates should be in the actual dollars as of compliance. Thus, for the

[1] Precompliance operating and maintenance expenditures are used to adjust the operating and maintenance component of the penalty. Quarterly precompliance expenditures larger than one-twelfth of the annual would result in negative penalties.

Exhibit IV-6

ACTUAL MONTHLY PRE-COMPLIANCE OPERATING AND MAINTENANCE EXPENSE

FERTILIZER COMPANY
August 1, 1980

Pre-compliance Operating Expense

Months 1-9		$ 0
Month 10		
Labor (84 hrs @ $10)	$840.00	
Power (1200 Kwh @ .0333 Kwh)	39.96	
Total		$ 879.96
Month 11		
Labor (110 hrs @ $10)	$1100.00	
Power (6739 Kwh @ .0333 Kwh)	224.40	
Total		$1,324.40

Fertilizer Company, which will come into compliance in 1980, the estimate for post-compliance annual operating and maintenance expenses should be in 1980 dollars. The program will automatically deflate this number to real terms as of the date of noncompliance. The Fertilizer Company submitted the data in Exhibit IV-7 as an estimate of post-compliance annual operating and maintenance expenditures.

Entry of the actual expenditures by the Fertilizer Company is shown in Exhibit IV-8. In addition, the data used to calculate the original penalty, such as the investment tax rate, income tax rate, etc., are entered in exactly the same manner as entered for the original penalty calculation. This is also shown in Exhibit IV-8. Note that the entry for all data after the annual operating and maintenance expense is identical to Exhibit II, the initial penalty calculation.

Exhibit IV-7

Fertilizer Company

OPERATING AND MAINTENANCE EXPENSE
August 1, 1980

1.	Annual Labor Expense	
	1072 Hours X $10.81 per hour =	$11,588.32
2.	Power Cost	
	89991.5 Kwh X $.038 per Kwh =	3,419.68
3.	Water Cost	
	_____ Gallons X $ _____ per gallon =	0
4.	Raw Materials and Supplies	
	1200 Lbs X $1.20 per lb. =	1,440.00
5.	Yearly increase in property tax =	0
6.	Cost of production lost due to maintenance or use of equipment =	0
7.	Total Cost (1 + 2 + 3 + 4 + 5 + 6) =	16,448.00
8.	Less: Value of by-products	
	800 Lbs. at $.56 per Lbs. =	(448.00)
9.	Annual Operating and Maintenance (7-8)	$16,000.00

Exhibit IV-8

DATA ENTRY FOR POSTCOMPLIANCE SETTLEMENT

```
THE FOLLOWING OBSERVATIONS ON CAPITAL EXPENDITURES AND
    OPERATING AND MAINTAINCE EXPENSE REFER TO THE
      ACTUAL CAPITAL EXPENDITURE AND O&M EXPENSE

* * * IN EACH MONTH ENTER CAPITAL EXPENDITURES * * *
* * * THEN OPERATING AND MAINTENANCE EXPENSE   * * *

MONTH # 1 ?0.0

MONTH # 2 ?0.0

MONTH # 3 ?0.0

MONTH # 4 ?0.0

MONTH # 5 ?0.0

MONTH # 6 ?0.0

MONTH # 7 ?0.0

MONTH # 8 ?0.0

MONTH # 9 ?184050.0

MONTH # 10 ?184050.879.96

MONTH # 11 ?184050.1324.40

TOTAL CAPITAL EXPENDITURE $  552150

 2 INITIAL ANNUAL O&M EXPENSE?16000
 3 INVESTMENT TAX RATE?10
 4 INCOME TAX RATE?49.23
 5 INFLATION RATE?8.3
 6 DISCOUNT RATE?15.84
 7 INTEREST RATE?8.76
 8 PREFERRED DIVIDEND RATE?8.88
 9 PREFERRED SHARE OF INVESTMENT?3.5
10 EQUITY SHARE OF INVESTMENT?47.7
11 DEPRECIATION LIFE IN YEARS?9
12 USEFUL LIFE IN YEARS?11
```

Output From The Post-Compliance Settlement Calculation

The output from the post-compliance settlement calculation incorporates the data on penalty payments made by the firm and compares these payments to a penalty schedule based on actual expenditures made to achieve compliance. The output consists of two parts:

- Printing of the penalty paid in each month and the penalty determined from actual expenditures. The difference between the actual penalty and the payment made by the firm is calculated in each month.

- The program allows the option of delaying the post-compliance settlement.

The output from the post-compliance settlement for the Fertilizer Company is shown in Exhibit IV-10. The first column prints the month in which a penalty payment was made or a penalty payment was required based on the post-compliance penalty calculation. The second column contains the actual payment made by the firm. The third column is the penalty based on actual expenditures made coming into compliance.

The program next calculates the difference between the penalty payment in each month and the new penalty calculation based on actual expenditures. The difference between the payment made and the actual penalty is then charged interest at the rate specified by the Treasury for the number of months after payment that the firm remained out of compliance.

Exhibit IV-10
THE POST-COMPLIANCE SETTLEMENT

[illegible] STRAIGHT LINE DEPRECIATION

MONTH	PENALTY PAID	ACTUAL PENALTY	AMOUNT DUE EPA	AMOUNT DUE FIRM
1	5213.86	8250.99	3037.13	0
4	5318.83	8417.11	3098.28	0
7	5425.92	8586.58	3160.66	0
10	5534.17	8759.46	3224.29	0

HOW MANY MONTHS ARE THERE BETWEEN COMPLIANCE AND PAYMENT OF POST-COMPLIANCE SETTLEMENT? 2
AMOUNT DUE EPA = $ 13514.88

The post-compliance settlement was calculated and paid two months after the Fertilizer Company came into compliance. For this reason, a 2 was entered when the program asked for the number of months between compliance and payment of the post-compliance settlement. Thus, the total post-compliance settlement paid by the firm to EPA is $13,514.88.

SPECIAL CONDITIONS

The preceding four sections enable the user to calculate the noncompliance penalty and post-compliance settlement when the source is privately owned and when compliance is achieved by modification of existing plant and equipment. In addition, it is assumed that financing would not involve industrial development bonds. Section V will expand the number of cases in which the penalty program is applicable and enable the user to compute the noncompliance penalty in the following situations.

- Plant and equipment necessary for compliance are financed through the sale of tax-exempt industrial development bonds.
- The source is operated by a local, state or federal government.
- The source has a limited useful life.

The noncompliance penalty in all three cases is calculated using the program PENALTY. However, it is necessary to modify some of the data entered into the program to reflect the unique characteristics of each of these situations. The following section describes special data requirements and modifications in data entry. It should

be stressed that all data and data entry procedures discussed in the four previous sections are applicable to these special conditions except where specific changes are required.

Industrial Development Bonds

Industrial development bonds for pollution control equipment are used by firms in order to secure debt financing at an interest cost lower than the current rate on industrial bonds. This lower interest rate is possible because the development bonds are issued by a local or state government for the corporation and the interest payments received by the bond holder are exempt from federal income tax. The corporation pays the principal and interest payments, but because of the tax-exempt status of the interest, the interest charges are often several percentage points below corporate debt of similar quality.

The Revenue Act of 1978 requires that firms financing with industrial development bonds receive only one-half of the investment tax credit when rapid amortization is used. For firms financing in part with development bonds, a pro-rata portion of this financing should be applied to the facility for determining the investment tax

credit. The computer program will automatically pro-rate the investment tax credit. The user must provide two types of data.

- The percentage of the investment financed by industrial development bonds.
- Interest rate on development bonds.

Data are gathered for the calculation of the penalty in the same manner as described in Section II. In addition, the user must perform the following calculations.

1. Percent financed with industrial development bonds. This percentage is obtained by dividing the total issue of tax-exempt pollution control industrial development bonds by the capital investment.[1] In the Fertilizer Company example, the estimated capital investment was $500,000. If the firm sold $200,000 in industrial development bonds, the percentage entered would be forty. This would be entered as 40.

2. Interest rate on industrial development bonds. The interest rate used for pollution control industrial development bonds is published by Smith, Barney, Harris Uphmm & Co. in the Bond Markets Review. The review is published weekly and the current yield on bonds is printed on the last page.

[1] The firm may issue bonds in a volume much higher than the capital investment. In this case financing is entered as 100 percent. The program will not accept data higher than 100 percent.

For the Fertilizer Company example, the latest reported yield on pollution control industrial development bonds is 6.85 percent. This yield is entered as the interest rate in the penalty program.

There are thus only two changes in the data entered for industrial development bonds as opposed to the example described in Section III. A percentage of the project financed with tax-exempt bonds is entered, and the interest rate used is for pollution control industrial development bonds. All other data entry remains the same.

Government-Owned Facilities

The use of the noncompliance penalty program for government facilities requires that all cash flows related to taxes be eliminated. In addition, no debt financing is considered and the discount rate is entered at ten percent. Exhibit V-1 shows the data entry procedure for non-complying sources owned by governments. Data labelled "no change" are calculated using the methods described in Section II.

Exhibit V-1

DATA ENTRY FOR GOVERNMENT FACILITIES

DATA CATEGORY	PROGRAM ENTRY
Pre-compliance Capital Expenditures	No Change
Pre-compliance Operating and Maintenance	No Change
Annual Operating and Maintenance	No Change
Investment Tax Credit	0
Income Tax Rate	0
Inflation Rate	No Change
Discount Rate	10.0
Interest Rate	0
Preferred Dividend Rate	0
Preferred Share of Investment	0
Equity Share of Investment	100.0
Depreciation Life in Years	No Change
Useful Life in Years	No Change

Facilities with Limited Useful Lives

The noncompliance penalty computer program will calculate penalties for facilities with limited useful lives. In cases where a noncomplying facility is to be operated for a period of time and then retired, the current program may be used. Capital and operating and maintenance cost estimates are made based on what it would cost to bring the source into compliance and the calculation proceeds in the normal manner. In such cases there are no precompliance operating and maintenance expenditures and the total capital expenditure is entered in the last month. There is no post-compliance settlement.

In cases where the noncomplying source is to be replaced by a new, complying facility after some period of noncompliance, program inputs and operation will be slightly different than at present. In such cases, the program will

- ask if the calculation is for a limited life facility that is being replaced,
- request an estimate of the capital and annual operating expenses required to bring the old source into compliance,
- request a schedule of precompliance total capital expenditures (for productive capability plus pollution control equipment) required to build the new source,

- request a schedule of precompliance O&M expenditures (for productive capability and pollution control equipment) associated with the new source, and
- request an estimate of annual production costs including pollution control operating and maintenance expenses at the new source.

The program will then calculate the penalty based on the costs of compliance at the old source but will be adjusted for precompliance expenditures on the new source. Once the new source is in operation and the old source is retired (and, thus, full compliance is achieved), a postcompliance settlement can be made. Such a settlement will consider only changes in the precompliance expenditures associated with the new source relative to the estimates made when the initial penalty calculation was carried out.

APPENDIX C

CLEAN AIR ACT

SECTION 120

NONCOMPLIANCE PENALTIES

COMPUTER PROGRAM

```
C
C     THIS PROGRAM COMPUTES THE NONCOMPLIANCE PENALTY
C     PRESCRIBED IN SECTION 120 OF THE CLEAN AIR ACT.
C
C     IT WAS WRITTEN BY ROBERT L HAYES OF TCH FINANCIAL
C     CONSULTANTS, NASHVILLE, TENNESSEE, UNDER CONTRACT
C     WITH THE UNITED STATES ENVIRONMENTAL PROTECTION
C     AGENCY.
C
C     THE PROGRAM FOLLOWS CLOSELY THE FEBRUARY 1979
C     TECHNICAL SUPPORT DOCUMENT.
C
C
C VARIABLE DICTIONARY
C
C   VECTORS
C        AC(J)      ADJUSTED CAPITAL COMPONENT IN MONTH J
C        AU(J)      ADJUSTED O & M COMPONENT IN MONTH J
C        D(K,J)     DEPRECIATION FRACTION IN YEAR J, TYPE K
C        DEP(J)     DEPRECIATION TAX SAVINGS IN YEAR J
C        CSNFLO(J)  NET CASH FLOW IN YEAR J
C        CSNOUT(J)  TOTAL CASH OUTFLOW IN YEAR J
C        DEDUCT(J)  TOTAL DEDUCTIONS FOR TAX PURPOSES
C        DELTA(J)   RECOMPUTED PENALTY LESS AMOUNT PAID
C        DIV(J)     PREFERRED STOCK DIVIDENDS PAID
C                     AT END OF YEAR J
C        INT(J)     INTEREST PAID AT END OF YEAR J
C        M(J)       O & M EXPENSE AT END OF YEAR J
C        P(J)       PENALTY PAYMENT DUE IN MONTH J
C        PAID(J)    PENALTY ACTUALLY PAID IN MONTH J
C        PRIN(J)    PRINCIPAL REPAYMENT AT END OF
C                     YEAR J
C        PRNOUT(J)  PRINCIPAL OUTSTANDING AT THE BEGINNING
C                     OF YEAR J
C        PRECAP(J)  PRE-COMPLIANCE CAP EXP IN MONTH J
C        PREF(J)    PREFERRED STOCK REDEEMED AT END OF
C                     YEAR J
C        PRFOUT(J)  PREFERRED STOCK OUTSTANDING AT BEGINNING
C                     OF YEAR J
C        PREM(J)    PRE-COMPLIANCE O & M EXP IN MONTH J
C        QUART(J)   QUARTERLY PENALTY DUE IN MONTH J
C        SC(J)      EQUIVALENT CAPITAL COMPONENT IN MONTH J
C        SU(J)      EQUIVALENT O & M COMPONENT IN MONTH J
C        TAXSAV(J)  TAX SAVINGS ON TAX DEDUCTIBLE EXPENSE
C        X(J)       FRACTION OF CAPITAL SPENT PRIOR TO MONTH J
C        Y(J)       FRACTION OF O & M SPENT IN MONTH J
C        Z(J)       DELTA(J) ADJUSTED TO COMPLIANCE DATE
C
C   VARIABLES
C        B          DEBT FRACTION OF CAPITAL STRUCTURE
C        CUMDEP     FRACTION OF ASSET ALREADY DEPRECIATED
C        DBTSHR     DEBT SHARE OF CAPITAL INVESTMENT (B)
C        UO         MONTHS FROM COMPLIANCE DATE TO SETTLEMENT
C        DDIV       DUMMY INDICATING COSTS DIVIDED BY 1000
C        DLIM       DUMMY INDICATING LIMITED LIFE FACILITY
C        DLUOP      DUMMY INDICATING VARIABLES BEING CHANGED
C        DLUMP      DUMMY INDICATING A LUMP SUM SETTLEMENT
C        DPOST      DUMMY INDICATING POST-COMPLIANCE SETTLEMENT
C        E          DISCOUNT RATE
C        E1         DISCOUNT RATE ON MONTHLY BASIS
```

00000100
00000200
00000300
00000400
00000500
00000600
00000700
00000800
00000900
00001000
00001100
00001200
00001300
00001400
00001500
00001600
00001700
00001800
00001900
00002000
00002100
00002200
00002300
00002400
00002500
00002600
00002700
00002800
00002900
00003000
00003100
00003200
00003300
00003400
00003500
00003600
00003700
00003800
00003900
00004000
00004100
00004200
00004300
00004400
00004500
00004600
00004700
00004800
00004900
00005000
00005100
00005200
00005300
00005400
00005500
00005600
00005700
00005800
00005900
00006000
00006100

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C       E4      DISCOUNT RATE ON A QUARTERLY BASIS                          00006200
C       EI      EQUITY SHARE OF CAPITAL INVESTMENT (%)                      00006300
C       F       PREFERRED STOCK FRACTION OF CAPITAL STRUCTURE               00006400
C       FIDB    FRACTION FINANCED BY INDUSTRIAL DEVELOPMENT BONDS           00006500
C       FRAPID  FRACTION OF DEPRECIATION SUBJECT TO RAPID                   00006600
C                 AMORTIZATION                                              00006700
C       I       FORECAST INFLATION RATE                                     00006800
C       II      INFLATION RATE ON MONTHLY BASIS                             00006900
C       I4      INFLATION RATE ON A QUARTERLY BASIS                         00007000
C       II      CAPITAL COST IN DOLLARS (INITIAL INVESTMENT)                00007100
C       IIOLD   CAPITAL COST FOR OLD FACILITY                               00007200
C       J       INDEX INDICATING THE YEAR                                   00007300
C       K       INDEX INDICATING THE YEAR                                   00007400
C       L       PERIOD OF DELAYED COMPLIANCE(MONTHS)                        00007500
C       LDPP    DELAY BEFORE INITIAL PENALTY PAYMENT (MONTHS)               00007600
C       LDTS    DUMMY INDICATING DEPRECIATION METHOD                        00007700
C       MDS     MONTHS DELAY IN SETTLEMENT                                  00007800
C       MO      INITIAL ANNUAL O & M EXPENSE ($)                            00007900
C       MOOLD   O & M COST FOR OLD FACILITY                                 00008000
C       M12     INITIAL MONTHLY O & M EXPENSE ($)                           00008100
C       NDEP    DEPRECIATION LIFE (YEARS)                                   00008200
C       NLOOP   NUMBER OF VARIABLES TO BE CHANGED                           00008300
C       NPP     NUMBER OF PENALTY PAYMENTS ACTUALLY MADE                    00008400
C       NUSE    USEFUL LIFE (YEARS)                                         00008500
C       NVAR    VARIABLE NUMBER BEING CHANGED                               00008600
C       PVACR   PRESENT VALUE OF ANNUAL CAPITAL RELATED FLOWS               00008700
C       PVADJ   PRESENT VALUE OF CASH FLOWS ADJ FOR PRE-COMPL EXP           00008800
C       PVDLA   PRESENT VALUE OF DELAYED CASH FLOWS                         00008900
C       PVIN    PRESENT VALUE OF INITIAL CASH FLOWS                         00009000
C       PVOM    PRESENT VALUE OF O & M CASH FLOWS                           00009100
C       PVPCE   PRESENT VALUE OF CASH FLOWS IN ALL CYCLES                   00009200
C       PVPEN   PRESENT VALUE OF PENALTY                                    00009300
C       PVIPCE  PRESENT VALUE OF CASH FLOWS IN FIRST CYCLE                  00009400
C       Q       EQUITY FRACTION OF CAPITAL STRUCTURE                        00009500
C       R       INTEREST RATE FOR POST-COMPL SETTLEMENT                     00009600
C       RDIV    PREFERRED STOCK DIVIDEND RATE                               00009700
C       RINT    INTEREST RATE ON DEBT                                       00009800
C       SAVING  PRESENT VALUE OF ECONOMIC SAVINGS OF DELAY                  00009900
C       SETTLE  POST-COMPLIANCE SETTLEMENT AMOUNT                           00010000
C       TITC    INVESTMENT TAX CREDIT RATE(%)                               00010100
C       TTR     MARGINAL INCOME TAX RATE (%)                                00010200
C       ZDELAY  ZTOTAL ADJUSTED TO SETTLEMENT DATE                          00010300
C       ZTOTAL  SUM OF Z(J) ADJUSTED TO COMPLIANCE DATE                     00010400
C                                                                           00010500
C       OTHER VARIABLES BEGINNING WITH Z ARE USED TO CONVERT                00010600
C         FROM INTEGER TO REAL                                              00010700
C                                                                           00010800
C                                                                           00010900
C                                                                           00011000
C MAIN PROGRAM                                                              00011100
C                                                                           00011200
C                                                                           00011300
C                                                                           00011400
      DIMENSION D(6,50),DEP(100),CUMLO(100),DEDUCT(100)                     00011500
      DIMENSION M(100),PRIN(100),PRNOUT(100),PREF(100)                      00011600
      DIMENSION PREOUT(100),INT(100),TAXBAV(100)                            00011700
      DIMENSION CUMOUT(100),DELTA(100),Z(100)                               00011800
      DIMENSION DIV(100),DF(100),PV(100)                                    00011900
      DIMENSION X(100),PRECAP(100),PROM(100),P(100)                         00012000
      DIMENSION SC(100),SO(100),AC(100),AO(100),PAID(100)                   00012100
      DIMENSION PVOTS(6),QUART(100),Y(100)                                  00012200
C                                                                           00012300
C                                                                           00012400
C                                                                           00012500
      INTEGER DEPMET,DRAPID,DLOOP,DDIV,DLIM                                 00012600
      INTEGER DPRCAP,DPROM,DPOST,DD,DATA                                    00012700
      REAL II,I,ITC,I1,MO,M12,M9                                            00012800
      REAL INT,M,I4,LUMP                                                    00012900
      REAL E1,E4,M8,IACT,IACT1                                              00013000
C                                                                           00013100
C                                                                           00013200
C   DATA INPUT                                                              00013300
C                                                                           00013400
C                                                                           00013500
      KR=6                                                                  00013600
      KW=5                                                                  00013700
   90 WRITE(KW,7400)                                                        00013800
      WRITE(KW,7401)                                                        00013900
      WRITE(KW,7402)                                                        00014000
 7400 FORMAT(5X,'IS THIS AN INITIAL PENALTY CALCULATION')                   00014100
 7401 FORMAT(5X, 'OR A POST-COMPLIANCE SETTLEMENT CALCULATION?')            00014200
 7402 FORMAT(5X,'0=INITIAL, 1=POST-COMPLIANCE:')                            00014300
      READ(KR,*)DPOST                                                       00014400
      IF(DPOST)93,93,80                                                     00014500
   80 WRITE(KW,7410)                                                        00014600
      WRITE(KW,7411)                                                        00014700
 7410 FORMAT(5X,'ITEMS 1 AND 2 SHOULD SHOW AMOUNTS ACTUALLY')               00014800
 7411 FORMAT(5X, 'EXPENDED')                                                00014900
C                                                                           00015000
   93 WRITE(KW,7422)                                                        00015100
 7422 FORMAT(5X,'IS THIS A LIMITED LIFE FACILITY? 1=YES, 0=NO')             00015200
      READ(KR,*)DLIM                                                        00015300
      IF(DLIM)97,97,95                                                      00015400
   95 WRITE(KW,7425)                                                        00015500
      WRITE(KW,7426)                                                        00015600
 7425 FORMAT(5X,'ITEMS 1 AND 2 SHOULD SHOW COSTS FOR THE')                  00015700
 7426 FORMAT(5X,'REPLACEMENT FACILITY')                                     00015800
C                                                                           00015900
   97 WRITE(KW,7535)                                                        00016000
 7535 FORMAT(5X,'PERCENTAGE FINANCED BY INDUSTRIAL DEVELOP',                00016100
     C  'MENT BONDS=')                                                      00016200
      READ(KR,*)FIDB                                                        00016300
      FIDB=FIDB/100.                                                        00016400
C                                                                           00016500
  100 DLOOP=1                                                               00016600
      DDIV=1                                                                00016700
      DATA=0                                                                00016800
 4000 FORMAT(F20.5)                                                         00016900
 4001 FORMAT(I20)                                                           00017000
 4002 FORMAT(I5,5F10.2)                                                     00017100
 6000 FORMAT(10X)                                                           00017200
  110 WRITE(KW,4005)                                                        00017300
 4005 FORMAT(5X,29H 1. MONTHS OUT OF COMPLIANCE=)                           00017400
      READ(KR,*)L                                                           00017500
      WRITE(KW,4010)                                                        00017600
      WRITE(KW,4011)                                                        00017700
 4010 FORMAT(5X,'FOR EACH MONTH ENTER CAPITAL EXPENDITURE')                 00017800
 4011 FORMAT(5X,'THEN OPERATING AND MAINTENANCE EXPENSE')                   00017900
      WRITE(KW,6000)                                                        00018000
      II=0.                                                                 00018100
      DO 133 J=1,L                                                          00018200
      WRITE(KW,4015)J                                                       00018300
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4015  FORMAT(5X,'MONTH',I3,' ENTER CAPITAL, O & M')                    00018400
 133  READ(KR,*)PRECAP(J),PROM(J)                                      00018500
 200  GO TO (210,3000),DLOOP                                           00018600
 210  WRITE(KW,4020)                                                   00018700
4020  FORMAT(5X,33H 2. INITIAL ANNUAL O & M EXPENSE=,F10.2)            00018800
      READ (KR,*)MONEY                                                 00018900
      IF(DPOST)200,200,203                                             00019000
 203  MONTHS/(1.+I1)**L                                                00019100
 200  CONTINUE                                                         00019200
      DO 212 J=1,L                                                     00019300
 217  IF(PROM(J)=MONEY/12.)212,212,213                                 00019400
 212  CONTINUE                                                         00019500
      GO TO (220,3000),DLOOP                                           00019600
 213  WRITE(KW,4025)                                                   00019700
      WRITE(KW,4026)                                                   00019800
4025  FORMAT(5X,'PRE-COMPLIANCE O & M LARGER THAN ONE=')               00019900
4026  FORMAT(5X,'TWELFTH OF ANNUAL O & M EXPENSE')                     00020000
      GO TO 100                                                        00020100
 220  WRITE(KW,4030)                                                   00020200
4030  FORMAT(5X,31H 3. INVESTMENT TAX CREDIT RATE=,F6.2)               00020300
      READ(KR,*)TITC                                                   00020400
      IF(TITC-1.)223,227,227                                           00020500
 223  IF(TITC)227,227,224                                              00020600
 224  DATA=1                                                           00020700
 227  TITC=TITC/100.                                                   00020800
      GO TO (230,3000),DLOOP                                           00020900
 230  WRITE(KW,4040)                                                   00021000
4040  FORMAT(5X,20H 4. INCOME TAX RATE=,F6.2)                          00021100
      READ(KR,*)TTR                                                    00021200
      IF(TTR-1.)233,237,237                                            00021300
 233  IF(TTR)237,237,234                                               00021400
 234  DATA=1                                                           00021500
 237  TTR=TTR/100.                                                     00021600
      GO TO (240,3000),DLOOP                                           00021700
 240  WRITE(KW,4050)                                                   00021800
4050  FORMAT(5X,28H 5. FORECAST INFLATION RATE=,F6.2)                  00021900
      READ(KR,*)I                                                      00022000
      IF(I-1.)243,247,247                                              00022100
 243  IF(I)247,247,244                                                 00022200
 244  DATA=1                                                           00022300
 247  I=I/100.                                                         00022400
      I1=(1.+I)**(1./12.)-1.                                           00022500
      GO TO (250,3000),DLOOP                                           00022600
 250  WRITE(KW,4060)                                                   00022700
4060  FORMAT(5X,18H 6. DISCOUNT RATE=,F6.2)                            00022800
      READ(KR,*)E                                                      00022900
      IF(E-1.)253,255,255                                              00023000
 253  IF(E)255,255,254                                                 00023100
 254  DATA=1                                                           00023200
 255  E=E/100.                                                         00023300
      GO TO (256,3000),DLOOP                                           00023400
 256  IF(E-I)258,258,260                                               00023500
 258  WRITE(KW,4065)                                                   00023600
4065  FORMAT(5X,'DISCOUNT RATE NOT GREATER THAN INFLATION RATE')       00023700
      GO TO 260                                                        00023800
 260  WRITE(KW,4070)                                                   00023900
4070  FORMAT(5X,18H 7. INTEREST RATE=,F6.2)                            00024000
      READ(KR,*)RINT                                                   00024100
      IF(RINT-1.)263,267,267                                           00024200
 263  IF(RINT)267,267,264                                              00024300
 264  DATA=1                                                           00024400

 267  RINT=RINT/100.                                                   00024500
      GO TO (270,3000),DLOOP                                           00024600
 270  WRITE(KW,4080)                                                   00024700
4080  FORMAT(5X,34H 8. PREFERRED STOCK DIVIDEND RATE=,F6.2)            00024800
      READ(KR,*)RDIV                                                   00024900
      IF(RDIV-1.)273,277,277                                           00025000
 273  IF(RDIV)277,277,274                                              00025100
 274  DATA=1                                                           00025200
 277  RDIV=RDIV/100.                                                   00025300
      GO TO (300,3000),DLOOP                                           00025400
 300  WRITE(KW,4090)                                                   00025500
4090  FORMAT(5X,31H 9. EQUITY SHARE OF INVESTMENT=,F6.2)               00025600
      READ(KR,*)U                                                      00025700
      IF(U-1.)303,307,307                                              00025800
 303  IF(U)307,307,304                                                 00025900
 304  DATA=1                                                           00026000
 307  U=U/100                                                          00026100
      GO TO (200,3000),DLOOP                                           00026200
 200  WRITE(KW,4100)                                                   00026300
4100  FORMAT(5X,20H10. PREFERRED STOCK SHARE=,F6.2)                    00026400
      READ(KR,*)F                                                      00026500
      IF(F-1.)283,287,287                                              00026600
 283  IF(F)287,287,284                                                 00026700
 284  DATA=1                                                           00026800
 287  F=F/100.                                                         00026900
      GO TO (290,3000),DLOOP                                           00027000
 290  WRITE(KW,4110)                                                   00027100
4110  FORMAT(5X,20H11. DEBT SHARE OF INVESTMENT=,F6.2)                 00027200
      READ(KR,*)D                                                      00027300
      IF(D-1.)313,317,317                                              00027400
 313  IF(D)317,317,314                                                 00027500
 314  DATA=1                                                           00027600
 317  D=D/100.                                                         00027700
      GO TO (324,3000),DLOOP                                           00027800
 324  IF(ABS(U+F+D-1.)-.005)350,325,325                                00027900
 325  WRITE(KW,6000)                                                   00028000
      WRITE(KW,4500)                                                   00028100
4500  FORMAT(5X,'EQUITY+PREFERRED+DEBT NOT = 100, TRY AGAIN')          00028200
      GO TO 300                                                        00028300
 350  WRITE(KW,4130)                                                   00028400
4130  FORMAT(5X,22H12. DEPRECIATION LIFE=,I4)                          00028500
      READ(KR,*)NDEP                                                   00028600
      GO TO (320,3000),DLOOP                                           00028700
 320  WRITE(KW,4140)                                                   00028800
4140  FORMAT(5X,18H13. USEFUL LIFE=,I4)                                00028900
      READ(KR,*)NUSE                                                   00029000
      GO TO (321,3000),DLOOP                                           00029100
 321  IF(DPOST)300,300,322                                             00029200
 322  WRITE(KW,4190)                                                   00029300
4190  FORMAT(5X,'14. HOW MANY PENALTY PAYMENTS WERE MADE?')            00029400
      READ(KR,*)NPP                                                    00029500
      DO 412 J=1,50                                                    00029600
 412  PAID(J)=0.                                                       00029700
      DO 415 J=1,NPP                                                   00029800
      WRITE(KW,7420)J                                                  00029900
7420  FORMAT(5X,'14. PAYMENT NUMBER',I3,': ENTER MONTH,AMOUNT')        00030000
      READ(KR,*)N9,PYMT                                                00030100
      IF(J-1)413,413,415                                               00030200
 413  LOPP=N9-1                                                        00030300
 415  PAID(N9)=PYMT                                                    00030400
      GO TO (417,3000),DLOOP                                           00030500
```

```
  417   WRITE(KW,7415)
 7415   FORMAT(5X,'15. TREASURY INTEREST RATE=',F6.2)
        READ(KR,*)R
        IF(R-1.)403,407,407
  403   IF(R)407,407,404
  404   DATA=1
  407   R=R/100.
        GO TO (360,3000),DLOOP
  360   IF(DLIM)420,420,365
  365   WRITE(KW,7440)
        WRITE(KW,7441)
 7440   FORMAT(5X,'16. CAPITAL COST WHICH WOULD HAVE ',
     C   'BEEN INCURRED')
 7441   FORMAT(5X,'    TO BRING EXISTING FACILITY INTO',
     C   ' COMPLIANCE')
        READ(KR,*)IIOLD
        IF(DPOST)375,375,370
  370   IIOLD=IIOLD*(1.+I1)**L
  375   GO TO (385,3000),DLOOP
  385   WRITE(KW,7447)
        WRITE(KW,7448)
 7447   FORMAT(5X,'17. O & M COST TO KEEP EXISTING FACILITY')
 7448   FORMAT(5X,'    IN COMPLIANCE=')
        READ(KR,*)MOOLD
        IF(DPOST)389,389,387
  387   MOOLD=MOOLD*(1.+I1)**L
  389   GO TO (420,3000),DLOOP
C
C
C
C       DATA CHECKS AND INITIALIZATIONS
C
C
C
C
C       COMPUTE MONTHLY AND QUARTERLY EQUIVALENT VALUES OF
C       E AND I FOR USE LATER IN THE PROGRAM.
  420   E1=(1.+E)**(1./12.)-1.
        E4=(1.+E)**(.25)-1.
        I4=(1.+I)**(.25)-1.
        M1=(1.+R)**(1./12.)-1.
C
        MO=MONEY
        IF(ABS(Q+P+B-1.)-.005)422,421,421
  421   WRITE(KW,6500)
        GO TO 100
  422   DO 423 J=1,L
        IF(PROM(J)-MO/12.)423,423,213
  423   CONTINUE
C
        IF(MO)428,428,426
  426   IF(DPOST)140,140,145
  140   DO 427 J=1,L
  427   Y(J)=12.*PROM(J)/MO
        GO TO 431
  145   DO 146 J=1,L
  146   Y(J)=(12.*PROM(J)*(1.+I1)**L)/(MO*(1.+I1)**(J-1))
        GO TO 431
  428   DO 429 J=1,L
  429   Y(J)=0.
  431   CONTINUE
        II=0
        DO 153 J=1,L
        IF(DPOST)125,125,130
  125   II=II+PRECAP(J)
        GO TO 153
  130   II=II+PRECAP(J)/(1.+I1)**J
  153   CONTINUE
 6059   X(1)=0.
        IF(II)6060,6060,6070
 6060   DO 6065 K=1,L
 6065   X(K)=1.
        GO TO 156
 6070   DO 6077 K=2,L
        IF(DPOST)6075,6075,6076
 6075   X(K)=X(K-1)+PRECAP(K-1)
        GO TO 6077
 6076   X(K)=X(K-1)+PRECAP(K-1)/(1.+I1)**(K-1)
 6077   CONTINUE
        DO 6078 K=1,L
 6078   X(K)=X(K)/II
C
C
  156   IF(DLIM)432,432,430
  430   II=IIOLD
        MO=MOOLD
  432   CONTINUE
  440   IF(II-1000000.)445,450,450
  445   IF(MO-100000.)475,450,450
  450   II=II/1000.
        DDIV=2
        MO=MO/1000.
        DO 460 J=1,L
        PAID(J)=PAID(J)/1000.
        PRECAP(J)=PRECAP(J)/1000.
  460   PROM(J)=PROM(J)/1000.
        WRITE(KW,6000)
        WRITE(KW,6000)
        WRITE(KW,6000)
 4600   FORMAT(5X,'NOTE THAT FIGURES BELOW ARE IN THOUSANDS')
  475   CONTINUE
        IF(DATA)457,457,453
  453   WRITE(KW,6570)
        WRITE(KW,6571)
 6570   FORMAT(5X,'NOTE THAT AT LEAST ONE OF YOUR DATA ENTRIES')
 6571   FORMAT(5X,'WAS A PERCENTAGE VALUE OF LESS THAN ONE')
        DATA=0
  457   CONTINUE
        IF(E-I)480,480,483
  480   WRITE(KW,6065)
        GO TO 100
  483   CONTINUE
        ZNDEP=ENDEP
        DO 490 J=1,100
        DEP(J)=0.
        Z(J)=0.
        DELTA(J)=0.
        CSHFLO(J)=0.
        DEDUCT(J)=0.
        M(J)=0.
        PRIN(J)=0.
        PRNOUT(J)=0.
        PREP(J)=0.
```

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      PRFOUT(J)=0.
      INT(J)=0.
      TAXSAV(J)=0.
      CSHOUT(J)=0.
      DIV(J)=0.
      DF(J)=0.
      P(J)=0.
      QUART(J)=0.
  490 PV(J)=0.
      DO 491 K=1,6
      PVDTS(K)=0.
      DO 491 J=1,50
  491 D(K,J)=0.
C
C
C     IF THIS IS A POST-COMPLIANCE CALCULATION,
C     ADJUST CAPITAL AND O & M VALUES TO REFLECT
C     INFLATION DURING THE NONCOMPLIANCE PERIOD
C
      IF(DPOST)499,499,492
  492 DO 495 J=1,L
      PRECAP(J)=PRECAP(J)/(1.+I1)**L
  495 PROM(J)=PROM(J)/(1.+I1)**L
      II=II/(1.+I1)**L
      MO=MO/(1.+I1)**L

C     BEGIN COMPUTING PENALTY
C
C
C     EQUATION (1) = EQUITY INVESTMENT
  499 EI=II*Q

C     EQUATION (2) = INVESTMENT TAX CREDIT
C     ITC=II*TITC*(1.-FIDB/2.)

C     DEPRECIATION CALCULATIONS FROM APPENDIX C
C
      DTSMAX=0.
      LDTS=99

C     STRAIGHT LINE DEPRECIATION
C
  500 DO 550 J=1,NDEP
      D(1,J)=1/ZNDEP
  550 PVDTS(1)=PVDTS(1)+D(1,J)/(1.+E)**J
      IF(PVDTS(1)-DTSMAX)600,600,560
  560 DTSMAX=PVDTS(1)
      LDTS=1

C     SUM OF YEARS DIGITS
C
  600 ZN8=INDEP*(ZNDEP+1)/2
      DO 650 J=1,NDEP
      D(2,J)=(ZNDEP+1-J)/ZN8
  650 PVDTS(2)=PVDTS(2)+D(2,J)/(1.+E)**J
      IF(PVDTS(2)-DTSMAX)700,700,660
  660 DTSMAX=PVDTS(2)
      LDTS=2

C     DOUBLE DECLINING BALANCE
C
  700 IF(NDEP-1)800,800,705
  705 CUMDEP=0
      DO 750 J=1,NDEP
      IF (NDEP-2*J+2) 725,710,710
  710 D(3,J)=(1-CUMDEP)*2/ZNDEP
      PVDTS(3)=PVDTS(3)+D(3,J)/(1.+E)**J
      GO TO 750
  725 D(3,J)=(1-CUMDEP)/(ZNDEP-J+1)
      PVDTS(3)=PVDTS(3)+D(3,J)/(1.+E)**J
  750 CUMDEP=CUMDEP+D(3,J)
      IF(PVDTS(3)-DTSMAX)800,800,760
  760 DTSMAX=PVDTS(3)
      LDTS=3

C     RAPID AMORTIZATION
C
  800 IF(NDEP-15)790,795,795
  790 FRAPID=1.
      GO TO 799
  795 FRAPID=15./ZNDEP
  799 DO 810 K=4,6
      DO 801 J=1,NDEP
      D(K,J)=D(K-3,J)*(1.-FRAPID)
  801 PVDTS(K)=PVDTS(K)+D(K,J)/(1.+E)**J
      DO 805 J=1,5
      D(K,J)=D(K,J)+FRAPID/5.
  805 PVDTS(K)=PVDTS(K)+(FRAPID/5.)/(1.+E)**J
      PVDTS(K)=PVDTS(K)-TITC*FIDB/2.
      IF(PVDTS(K)-DTSMAX)810,810,808
  808 DTSMAX=PVDTS(K)
      LDTS=K
  810 CONTINUE

C     EQUATION (3) = DEPRECIATION TAX SAVINGS
C
      DO 950 J=1,NDEP
  950 DEP(J)=II*D(LDTS,J)*TTR

C     EQUATION (4) = DEBT SHARE OF INVESTMENT
C     DBTSHR=II*B

C     INITIAL PRIN OUTSTANDING EQUALS DEBT SHARE
C     PRNOUT(1)=DBTSHR

C     EQUATION(11) = PREFERRED STOCK SHARE OF INVESTMENT
C     PRFSHR=II*F

C     INITIAL PREFERRED OUTSTANDING IS PREFERRED SHARE
C     PRFOUT(1)=PRFSHR

C
C     THE FOLLOWING SECTION CALCUALATES THE ANNUAL CAPITAL-
C     RELATED CASH FLOWS
C
      DO 1100 J=1,NDEP

C     EQUATION (5) = PRINCIPAL PAYMENT
C     PRIN(J)=D(LDTS,J)*II*B

C     COMBINING EQUATIONS (8) AND (9)
C     PRNOUT(J+1)=PRNOUT(J)-PRIN(J)

C     EQUATION (7) = INTEREST CASH FLOW
C     INT(J)=PRINT*PRNOUT(J)*(1-TTR)
C
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C       EQUATION (12) = PREFERRED STOCK REDEMPTION                          00055000
        PREF(J)=D(LDTS,J)*II*F                                              00055100
C                                                                           00055200
C       COMBINING EQUATIONS (14) AND (15)                                   00055300
        PRFOUT(J+1)=PRFOUT(J)-PREF(J)                                       00055400
C                                                                           00055500
C       EQUATION (13) = PREFERRED STOCK DIVIDEND PAYMENT                    00055600
        DIV(J)=RDIV*PRFOUT(J)                                               00055700
C                                                                           00055800
 1100   CONTINUE                                                            00055900
C                                                                           00056000
C       NOTE: EQUATION (17), D & M, IS COMBINED BELOW WITH                  00056100
C       EQUATIONS (21) AND (22)                                             00056200
C                                                                           00056300
C       DISCOUNTING CASH FLOWS                                              00056400
C                                                                           00056500
C       EQUATION (18) = INITIAL CASH FLOW                                   00056600
        PVIN=II*Q-ITC                                                       00056700
C                                                                           00056800
C       COMBINING EQUATIONS (19) AND (20) = ANNUAL CAPITAL                  00056900
C       RELATED                                                             00057000
        PVACR=0                                                             00057100
        DO 1200 J=1,NDEP                                                    00057200
 1200   PVACR=PVACR+(-DEP(J)+PRIN(J)+INT(J)+PREF(J)+DIV(J))/                00057300
     C  (1+E)**J                                                            00057400
C                                                                           00057500
C       EQUATIONS (17),(21)AND (22) COMBINED = O AND M                      00057600
        PVOM=0                                                              00057700
        DO 1300 J=1,NUSE                                                    00057800
        M(J)=M0*(1.+I)**J                                                   00057900
 1300   PVOM=PVOM+M(J)*(1.-TTR)/(1.+E)**J                                   00058000
C                                                                           00058100
C       EQUATION (23) = PRESENT VALUE OF FIRST CYCLE FLOWS                  00058200
        PVIPCE=PVIN+PVACR+PVOM                                              00058300
C                                                                           00058400
C                                                                           00058500
C       EQUATION (24) = PRESENT VALUE OF FLOWS FOR ALL CYCLES               00058600
        PVPCE=PVIPCE*(1./(1.-((1.+I)/(1.+E))**NUSE))                        00058700
C                                                                           00058800
C       EQUATION (26) = PRESENT VALUE OF DELAYED FLOWS                      00058900
        PVDLA=PVPCE*((1.+I1)/(1.+E1))**L                                    00059000
C                                                                           00059100
C       EQUATION (27) = ECONOMIC SAVINGS CALCULATION                        00059200
        SAVING=PVPCE-PVDLA                                                  00059300
C                                                                           00059400
C                                                                           00059500
C                                                                           00059600
C       CONVERT SAVINGS INTO A MONTHLY PENALTY                              00059700
C                                                                           00059800
C       EQUATION (33) AND (34) = MONTHLY SAVINGS EQUIVALENTS                00059900
 6025   SC(1)=((E1-I1)/(1.+E1))*(PVIN+PVACR)*                               00060000
     C    (1./(1.-((1.+I)/(1.+E))**NUSE))                                   00060100
        SO(1)=((E1-I1)/(1.+E1))*PVOM*(1./(1.-((1.+I)/(1.+E))                00060200
     C  **NUSE))                                                            00060300
 6040   DO 6050 K=1,L                                                       00060400
        SC(K)=SC(1)*(1.+I1)**(K-1)                                          00060500
 6050   SO(K)=SO(1)*(1.+I1)**(K-1)                                          00060600
C                                                                           00060700
C       EQUATION (35) = ADJUSTED SAVINGS EQUIVALENT                         00060800
 6080   DO 6100 K=1,L                                                       00060900
        AC(K)=(1.-X(K))*SC(K)                                               00061000
        AO(K)=(1.-Y(K))*SO(K)                                               00061100
        IF(AO(K))6090,6100,6100                                             00061200
 6090   AO(K)=0                                                             00061300
 6100   CONTINUE                                                            00061400
C                                                                           00061500
C       EQUATION (36) = PRESENT VALUE OF ADJUSTED SERIES                    00061600
        PVADJ=0.                                                            00061700
        DO 6150 K=1,L                                                       00061800
 6150   PVADJ=PVADJ+(AC(K)+AO(K))/((1.+E1)**(K-1))                          00061900
C                                                                           00062000
C       EQUATIONS (38) & (39) = PENALTY PAYMENT SERIES                      00062100
        DENOM=0.                                                            00062200
        DO 6175 K=1,L                                                       00062300
 6175   DENOM=DENOM+((1.+I1)/(1.+E1))**(K-1)                                00062400
        P(1)=PVADJ/DENOM                                                    00062500
        DO 6200 K=1,L                                                       00062600
 6200   P(K)=P(1)*(1.+I1)**(K-1)                                            00062700
C                                                                           00062800
C                                                                           00062900
C       PRINT OUT THE DEPRECIATION METHOD                                   00063000
        WRITE(KW,6000)                                                      00063100
        WRITE(KW,6000)                                                      00063200
        GO TO (6210,6215,6220,6225,6230,6235),LDTS                          00063300
 6210   WRITE(KW,6211)                                                      00063400
 6211   FORMAT(5X,'STRAIGHT LINE, STANDARD AMORTIZATION')                   00063500
        GO TO 6240                                                          00063600
 6215   WRITE(KW,6216)                                                      00063700
 6216   FORMAT(5X,'SUM OF YEARS DIGITS, STANDARD AMORTIZATION')             00063800
        GO TO 6240                                                          00063900
 6220   WRITE(KW,6221)                                                      00064000
 6221   FORMAT(5X,'DOUBLE DECLINING BALANCE, STANDARD AMORTIZATION')        00064100
        GO TO 6240                                                          00064200
 6225   WRITE(KW,6226)                                                      00064300
 6226   FORMAT(5X,'STRAIGHT LINE, RAPID AMORTIZATION')                      00064400
        GO TO 6240                                                          00064500
 6230   WRITE(KW,6231)                                                      00064600
 6231   FORMAT(5X,'SUM OF YEARS DIGITS, RAPID AMORTIZATION')                00064700
        GO TO 6240                                                          00064800
 6235   WRITE(KW,6236)                                                      00064900
 6236   FORMAT(5X,'DOUBLE DECLINING BALANCE, RAPID AMORTIZATION')           00065000
 6240   CONTINUE                                                            00065100
C                                                                           00065200
C                                                                           00065300
        PVPEN=0.0                                                           00065400
        DO 6300 K=1,L                                                       00065500
 6300   PVPEN=PVPEN+P(K)/(1.+E1)**(K-1)                                     00065600
        WRITE(KW,6000)                                                      00065700
C                                                                           00065800
C                                                                           00065900
C       COMPUTE QUARTERLY PENALTY AMOUNTS AND PRINT THEM                    00066000
        IF(DPOST)7190,7190,6308                                             00066100
 7190   WRITE(KW,7001)                                                      00066200
        WRITE(KW,7002)                                                      00066300
        WRITE(KW,7003)                                                      00066400
 7001   FORMAT(5X,'HOW MANY MONTHS AFTER THE FIRST DAY OF')                 00066500
 7002   FORMAT(5X,'NONCOMPLIANCE WILL THE INITIAL PENALTY')                 00066600
 7003   FORMAT(5X,'PAYMENT BE MADE?')                                       00066700
        READ(KR,*)LDPP                                                      00066800
 6308   ZL=L                                                                00066900
        Z0=0                                                                00067000
                                                                            00067100
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      NQ=AINT((ZL-.01)/3.)+1                                            00067200
      DO 6310 J=1,NQ                                                    00067300
 6310 Z6=Z6+((1.+I4)/(1.+E4))**(J-1)                                    00067400
      QUART(1)=PVPEN/Z6                                                 00067500
      IF(NQ-1)6315,6315,6312                                            00067600
 6312 DO 6314 J=2,NQ                                                    00067700
 6314 QUART(3*J-2)=QUART(3*J-5)*(1.+I4)                                 00067800
 6315 CONTINUE                                                          00067900
      IF(LDPP)7150,7150,6317                                            00068000
 6317 IF(LDPP-6)6318,6318,6330                                          00068100
 6318 DO 6321 J=1,LDPP                                                  00068200
      QUART(LDPP+1)=QUART(LDPP+1)+QUART(J)                              00068300
 6321 QUART(J)=0.                                                       00068400
      GO TO 7150                                                        00068500
 6330 DO 6335 J=7,LDPP                                                  00068600
      QUART(LDPP+1)=QUART(LDPP+1)+QUART(J)*(1.+E1)**(LDPP-J+1)          00068700
 6335 QUART(J)=0.                                                       00068800
      QUART(LDPP+1)=QUART(LDPP+1)+(QUART(1)+QUART(6))*                  00068900
     C  (1.+E1)**(LDPP-6)                                               00069000
      QUART(1)=0.                                                       00069100
      QUART(6)=0.                                                       00069200
 7150 IF(DPOST)7151,7151,6390                                           00069300
 7151 WRITE(KW,6000)                                                    00069400
      WRITE(KW,7550)                                                    00069500
 7550 FORMAT(5X,'      MONTH       PAYMENT')                           00069600
      DO 6343 J=1,50                                                    00069700
      IF(QUART(J))6343,6343,6340                                        00069800
 6340 WRITE(KW, 7505)J,QUART(J)                                         00069900
 6343 CONTINUE                                                          00070000
      WRITE(KW,6000)                                                    00070100
C                                                                       00070200
C                                                                       00070300
      WRITE(KW,7560)                                                    00070400
      WRITE(KW,7561)                                                    00070500
 7560 FORMAT(5X,'DO YOU WISH TO SEE A LUMP SUM')                        00070600
 7561 FORMAT(5X,'SETTLEMENT? 1=YES,0=NO:')                              00070700
      READ(KR,*)DLUMP                                                   00070800
      IF(DLUMP)7299,7299,6380                                           00070900
C                                                                       00071000
C     COMPUTE THE VALUE OF THE NONCOMPLIANCE PENALTY MDS                00071100
C     MONTHS AFTER THE DATE OF NONCOMPLIANCE                            00071200
C                                                                       00071300
 6380 WRITE(KW,7575)                                                    00071400
      WRITE(KW,7576)                                                    00071500
      WRITE(KW,7577)                                                    00071600
 7575 FORMAT(5X,'HOW MANY MONTHS AFTER THE FIRST DAY OF')               00071700
 7576 FORMAT(5X,'NONCOMPLIANCE WILL THE LUMP SUM')                      00071800
 7577 FORMAT(5X,'SETTLEMENT BE MADE?')                                  00071900
      READ(KR,*)MDS                                                     00072000
C                                                                       00072100
      SETTLE=PVPEN*(1.+E1)**MDS                                         00072200
      WRITE(KW,7200)                                                    00072300
 7200 FORMAT(5X,'THE VALUE OF THE NONCOMPLIANCE PENALTY')               00072400
      WRITE(KW,7201)MDS                                                 00072500
 7201 FORMAT(5X,'COMPUTED AS OF',I4,' MONTHS AFTER THE DATE')           00072600
      WRITE(KW,7203)SETTLE                                              00072700
 7203 FORMAT(5X,'OF NONCOMPLIANCE IS',28X,F13.2)                        00072800
      WRITE(KW,7205)                                                    00072900
 7205 FORMAT(57X,8H=========)                                           00073000
      GO TO 7299                                                        00073100
C                                                                       00073200
C     COMPUTE POST-COMPLIANCE SETTLEMENT                                00073300
C                                                                       00073400
C                                                                       00073500
 6390 ZTOTAL=0.0                                                        00073600
      IF(L-6)6381,6381,6385                                             00073700
 6381 DO 6383 J=1,L                                                     00073800
      DELTA(J)=PAID(J)-QUART(J)                                         00073900
      Z(J)=DELTA(J)                                                     00074000
 6383 ZTOTAL=ZTOTAL+Z(J)                                                00074100
      GO TO 6359                                                        00074200
 6385 DO 6350 J=1,L                                                     00074300
      DELTA(J)= PAID(J)-QUART(J)                                        00074400
      IF(J-6)6351,6351,6355                                             00074500
 6351 Z(J)=DELTA(J)*(1.+R1)**(L-6)                                      00074600
      GO TO 6350                                                        00074700
 6355 Z(J)=DELTA(J)*(1.+R1)**(L-J+1)                                    00074800
 6350 ZTOTAL=ZTOTAL+Z(J)                                                00074900
 6359 CONTINUE                                                          00075000
C                                                                       00075100
      WRITE(KW,7580)                                                    00075200
 7580 FORMAT(1X,'MONTH     PAID   PENALTY   DUE EPA   DUE FIRM')        00075300
      DO 6440 J=1,100                                                   00075400
      ZE=0                                                              00075500
      ZF=0                                                              00075600
      IF(QUART(J))6410,6410,6420                                        00075700
 6410 IF(PAID(J))6440,6440,6420                                         00075800
 6420 IF(DELTA(J))6450,6450,6460                                        00075900
 6450 ZE=-DELTA(J)                                                      00076000
      GO TO 6430                                                        00076100
 6460 ZF=DELTA(J)                                                       00076200
 6430 WRITE(KW,4002)J,PAID(J),QUART(J),ZE,ZF                            00076300
 6440 CONTINUE                                                          00076400
      WRITE(KW,6000)                                                    00076500
      WRITE(KW,7755)                                                    00076600
 7755 FORMAT(5X,'MONTHS FROM COMPLIANCE UNTIL SETTLEMENT=')             00076700
      READ(KR,*)DD                                                      00076800
      ZDELAY=ZTOTAL*(1.+R1)**DD                                         00076900
      WRITE(KW,6000)                                                    00077000
      IF(ZDELAY)6461,6461,6465                                          00077100
 6461 ZDELAY=-ZDELAY                                                    00077200
      WRITE(KW,7756)ZDELAY                                              00077300
 7756 FORMAT(5X,'SETTLEMENT DUE EPA=',F10.2)                            00077400
      GO TO 6475                                                        00077500
 6465 WRITE(KW,7757)ZDELAY                                              00077600
 7757 FORMAT(5X,'SETTLEMENT DUE FIRM=',F10.2)                           00077700
 6475 CONTINUE                                                          00077800
C                                                                       00077900
C                                                                       00078000
C                                                                       00078100
C                                                                       00078200
C     CREATE THE OPTION TO CHANGE SOME OF THE VARIABLES                 00078300
C                                                                       00078400
      WRITE(KW,6000)                                                    00078500
      WRITE(KW,6000)                                                    00078600
      WRITE(KW,6000)                                                    00078700
 7299 CONTINUE                                                          00078800
      WRITE(KW,7300)                                                    00078900
 7300 FORMAT(5X,'HOW MANY VARIABLES DO YOU WISH TO CHANGE ',            00079000
     C  '?')                                                            00079100
      READ(KR,*)NLOOP                                                   00079200
      IF(NLOOP)99999,99999,2700                                         00079300
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2700    IF(NLOOP-999)2800,2710,2710                                     00079400
2710    WRITE(KW,7501)                                                  00079500
7501    FORMAT(5X,'1, PRECOMPLIANCE EXPENDITURES')                      00079600
        WRITE(KW,7502)                                                  00079700
7502    FORMAT(5X,'      MONTH       CAPITAL          O & M')          00079800
        DO 2715 J=1,L                                                   00079900
        IF(DPOST)2712,2712,2714                                         00080000
2712    ZC=PRECAP(J)                                                    00080100
        ZM=PROM(J)                                                      00080200
        GO TO 2715                                                      00080300
2714    ZC=PRECAP(J)*(1.+I1)**L                                         00080400
        ZM=PROM(J)*(1.+I1)**L                                           00080500
2715    WRITE(KW,7505)J,ZC,ZM                                           00080600
7505    FORMAT(12X,I2,F15.2,F15.2)                                      00080700
2720    ZM0=M0                                                          00080800
2724    WRITE(KW,4020)Z40                                               00080900
        ZTITC=100.*TITC                                                 00081000
        WRITE(KW,4030)ZTITC                                             00081100
        ZTTR=100.*TTR                                                   00081200
        WRITE(KW,4040)ZTTR                                              00081300
        ZI=100.*I                                                       00081400
        WRITE(KW,4050)ZI                                                00081500
        ZE=100.*E                                                       00081600
        WRITE(KW,4060)ZE                                                00081700
        ZRINT=100.*RINT                                                 00081800
        WRITE(KW,4070)ZRINT                                             00081900
        ZRDIV=100.*RDIV                                                 00082000
        WRITE(KW,4080)ZRDIV                                             00082100
        ZQ=100.*Q                                                       00082200
        WRITE(KW,4090)ZQ                                                00082300
        ZF=100.*F                                                       00082400
        WRITE(KW,4100)ZF                                                00082500
        ZB=100.*B                                                       00082600
        WRITE(KW,4110)ZB                                                00082700
        WRITE(KW,4130)NDEP                                              00082800
        WRITE(KW,4140)NUSE                                              00082900
        IF(DPOST)2735,2735,2725                                         00083000
2725    WRITE(KW,7524)                                                  00083100
7524    FORMAT(5X,'10, PENALTY PAYMENTS')                               00083200
        WRITE(KW,7525)                                                  00083300
7525    FORMAT(5X,'      MONTH        PAYMENT')                         00083400
        DO 2733  J=1,100                                                00083500
        IF(PAID(J))2733,2733,2730                                       00083600
2730    WRITE(KW,7505)J,PAID(J)                                         00083700
2733    CONTINUE                                                        00083800
        ZR=R*100.                                                       00083900
        WRITE(KW,7515)ZR                                                00084000
        WRITE(KW,6000)                                                  00084100
2735    GO TO 7299                                                      00084200
2800    OLOOP=2                                                         00084300
        IF(DPOST)2811,2811,2805                                         00084400
2805    DO 2809 J=1,L                                                   00084500
        PRECAP(J)=PRECAP(J)*(1.+I1)**L                                  00084600
2809    PROM(J)=PROM(J)*(1.+I1)**L                                      00084700
        I1=I1*(1.+I1)**L                                                00084800
        M0=M0*(1.+I1)**L                                                00084900
2811    IF(DDIV-1)2820,2820,2812                                        00085000
2812    I1=I1*1000.                                                     00085100
        M0=M0*1000.                                                     00085200
        DO 2815 J=1,L                                                   00085300
        PAID(J)=PAID(J)*1000.                                           00085400
        PRECAP(J)=PRECAP(J)*1000.                                       00085500
2815    PROM(J)=PROM(J)*1000.                                           00085600
        DDIV=1                                                          00085700
2820    WRITE(KW,7310)                                                  00085800
7310    FORMAT(5X,'TYPE NUMBER OF VARIABLE:')                           00085900
        READ(KR,*)NVAR                                                  00086000
        GO TO (110,210,220,230,240,250,260,270,                         00086100
      C  300,280,290,350,320,322,417,365,385),NVAR                      00086200
3000    NLOOP=NLOOP+1                                                   00086300
        IF(NLOOP)420,420,2820                                           00086400
99999   STOP                                                            00086500
        END                                                             00086600
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